

YORKSHIRE PHILOSOPHICAL SOCIETY.

ANNUAL REPORT

FOR

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ANNUAL REPORT
OF THE COUNCIL
OF THE
YORKSHIRE
PHILOSOPHICAL SOCIETY

FOR
MCMXI.

PRESENTED TO THE ANNUAL MEETING,
FEBRUARY, 1912.



YORK:
COULTAS & VOLANS LTD., PRINTERS, LITTLE STONEGATE.
1912.

TRUSTEES
OF
THE YORKSHIRE MUSEUM,
APPOINTED BY ROYAL GRANT,

TEMPEST ANDERSON, M.D.

GEORGE A. AUDEN, M.D.

LORD DERAMORE.

CHAS. E. ELMHIRST.

SIR GEORGE GIBB, LL.B.

EDWIN GRAY, LL.M.

PATRONS
OF THE
Yorkshire Philosophical Society.

HIS MAJESTY THE KING.

HER MAJESTY THE QUEEN.

QUEEN ALEXANDRA.

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W. WILKINSON.

Elected 1912... CECIL HENRY COBB, M.A., Oxon.

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J. N. KITCHING.

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CHAS. E. ELMHIRST.

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GEOLOGY - - - - -	Rev. W. JOHNSON, B.A., B.Sc.
MINERALOGY - - - - -	H. M. PLATNAUER, B.Sc.
COMPARATIVE ANATOMY - -	T. ANDERSON, M.D., D.Sc.
ORNITHOLOGY - - - - -	J. BACKHOUSE, F.Z.S., M.B.O.U.
BOTANY - - - - -	H. J. WILKINSON.
OBSERVATORY - - - - -	DENNIS TAYLOR.
METEOROLOGY - - - - -	THE REV. W. JOHNSON, B.A.
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ENTOMOLOGY - - - - -	S. WALKER.
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G. YELD, M.A.
G. BENSON.
S. WALKER.
MAJOR ALLENBY.
THE SECRETARIES (*ex-officio*).

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R. THOMPSON.
THE SECRETARIES (*ex-officio*).

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President :

DR. TEMPEST ANDERSON.

Vice-Presidents :

J. N. KITCHING.
CECIL H. COBB.

Secretary :

M. SPENCE.

President :

DR. TEMPEST ANDERSON.

Vice-Presidents :

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S. WALKER.
W. INGHAM.
R. DUTTON.

Secretaries :

S. SMITH.
V. G. F. ZIMMERMAN.

KEEPER OF THE MUSEUM :

OXLEY GRABHAM, M.A., M.B.O.U.

REPORT OF THE COUNCIL
OF THE
YORKSHIRE PHILOSOPHICAL SOCIETY,
FEBRUARY, 1912.

I N presenting the Annual Report for the Year 1911, the Council feel that, as in our previous report they recorded the death of the late King Edward the 7th, so our first paragraph should deal with the Accession and Coronation of His present Majesty King George the 5th. Both King George and his Royal Consort are Patrons of our Society, and the Museum Gardens were thrown open to the public free of charge on the 22nd and 23rd June last, when the festivities in celebration of the Coronation were held.

It is thought well to remind not only our members, but the Citizens of York generally, that your Council are ready at all times to assist in any public celebrations and social functions so far as compatible with the interest of our members and the trusts of our Society.

During the past year in addition to the nominal charge of 1d. on Saturdays, the gardens have been thrown open on numerous occasions. On the 3rd July the Lord Mayor and Sheriff held a Municipal Garden Party to entertain the visitors from our Dominions beyond the seas, and our members acted as guides, not only around the priceless antiquities within our Gardens, but also in and around the City. On the 14th of the same month, 100 German working men were received and addressed

It is urgently requested that any discovery of Archæological interest in the neighbourhood may be brought to the notice of either the Chairman, Honorary Curators, or the Curator as early as possible.

The Curator will be pleased to give any information in his power, and may be seen daily, Museum engagements permitting.



Postcards of many of the most important antiquities may be obtained in the Museum at Two Pence each.

beneath the shade of the trees and thoroughly enjoyed a description of the Roman and other remains entrusted to our care. At Whitsuntide the gardens were again thrown open to the public for 2 days, and on St. Mark's Day the Industrial School children are invited to play in the Gardens.

Privilege tickets are granted to students, and classes from the elementary and secondary schools are admitted to the Museum for science teaching throughout the year. All this shews that our members are no selfish clique, and that though they pay liberally for the upkeep of the Museum and grounds, they generously share its advantage with their neighbours.

The public are sometimes apt to forget that the Philosophical Society purchased at a heavy cost fully two-thirds of their grounds and are still engaged in repaying the money borrowed for this purpose, and that if the gardens are attractive and the membership restricted, that our members are willing to continue the comparatively high annual subscription by which alone that beauty can be maintained.

A capital sum of no less than £25,000 in addition to annual maintenance has been spent upon the Museum and Gardens since the Society was formed. The area of the gardens is very small, and the Roman remains, St. Leonard's Hospital and the ruins of St. Mary's Abbey are priceless and place the grounds in an entirely different position from that of the ordinary open space or public park. In this connection it is worth quoting from that delightful book, "Highways and Byways of Yorkshire," when speaking of the Museum gardens its talented Author writes:—"A pleasant stretch of shady turf and winding walks enclosing a group of ruins and remains which takes high rank even in Yorkshire for its beauty, and for wealth of human interest is unsurpassed." Prior to our Society's rescuing these grounds the Abbey was used as a target for musket practice, whilst a row of lime kilns were rapidly converting the ruins into building material and agricultural tillage.

It sometimes takes several weeks for the lawns to recover from the wear and tear of two free days at Whitsuntide, and with the restricted use of our members it is often difficult to preserve the turf, and a certain amount of re-sodding has to be done every year.

Last year your Council announced that the plans for the new Lecture Theatre, so generously erected by the influence of our President, Dr. Tempest Anderson, were complete; this year sees the building erected and it is hoped that within a few months it will be completed and ready for use. The Central Hall with balcony takes the place of the old Lecture Theatre, and supplies an exceedingly handsome Reception room.

During the past year the heating apparatus of the Museum has been overhauled and extended with modern radiators, and the pipes extend not only to the new Lecture Theatre but also to the working room 39 feet by 26 feet.

Your Council have during the past year gone carefully over the Fire Insurance of the various buildings and contents and considerably increased the amount.

Owing to the building operations, affecting not only the new Lecture Theatre, but also the basement of the Museum and Central Hall, it has not been possible to hold the usual Lecture Programme, but it is hoped that the new Theatre will be finished in time to allow of one or two Lectures, being given this Spring.

The financial statement shews an excess of expenditure over income of £48 9s. 8d., but considering that no less than £236 has been spent in additions and repairs, including new lavatories and heating apparatus, and that the balance in the hands of the Treasurer still amounts to £179, your Council feels that the members have no grounds for complaint.

Your Council recommend Messrs. C. K. Hitchcock, Harvey Brooke, Cecil Cobb and J. N. Kitching as new Members of Council in the place of those retiring by rotation.

The Society has lost 12 Members and 4 Lady Subscribers by death, and 25 Members, 6 Lady Subscribers and 2 Associates by resignation during the past year. The number of new Members who have been elected during the same period is as follows: New Members, 37, Lady Subscribers, 11, Associates, 4; shewing a small increase in Lady Subscribers and Associates.

• **ANTIQUITIES.**—A number of carved stones found during the excavations for the Museum additions, which will be reported on by the Architect Mr. E. Ridsdale Tate; a portion of an ornamented plaster ceiling from a house demolished in Barker Lane; a fine urn from a tumulus at Thornton Dale, opened by Mr. Oxley Grabham, Keeper of the Museum. This urn is described and illustrated in another part of the Report by Dr. J. L. Kirk, of Pickering.

The vestibule to the Monastic Chapter House has been enclosed, and is intended to be used as a Museum for mediæval antiquities.

An inscribed slab commemorating a member of the Sixth Legion has been found at the Mount School. A description of it by Mr. H. M. Platnauer appears in another part of the Report. The Museum is the proper home for such antiquities. It is hoped that the Trustees of the School may see their way to present the slab to the Philosophical Society; especially since the Mother Superior of S. Mary's Convent presented the beautiful statue of a Roman soldier and other objects found on those premises.

The Museum has a fine collection of objects of archæological interest, and in this connection it is pleasing to record that the local archæological Society now hold its meetings at the Museum.

BOTANY.—The specimens in the Herbarium are in good condition. No additions have been made during the year 1911.

ENTOMOLOGICAL SECTION.—Nothing noteworthy has been added to this department during the past year. The various collections remain in good order. The removal from the Council Chamber to the new work-room will enable arrangements to be made for several of the minor collections of Insects to be available for the use of students of Entomology in future. It is very desirable to start what has been long needed in this Museum, viz., a Collection of the several orders of Yorkshire Insects only—formed on the almost complete list which appears in the “Victorian History” of this County.

GEOLOGY.—The collections are in good order, and the Hon. Curator reports that nothing has occurred of special interest except the cutting through the moraines for the Selby and Cottingwith Light Railway. This has only confirmed previous beliefs as to their origin and composition. Another block of shap granite was found on the site of the Fever Hospital. The opening of the new building at the Museum has supplied workers with an excellent room for practical work, and the extra facilities for seeing and handling specimens will be greatly appreciated by students.

LIBRARY.—The preparation of a card catalogue arranged both by subjects and authors has been begun, but unfortunately the recent alterations and extensions have caused such terrible confusion in the Library that any work upon it has latterly been quite out of the question.

MINERALOGY.—The collections are in good order. The only addition made during the year is a somewhat Tabular crystal of Apatite from Untersulzbachthal, (Salzburg) which has been presented by the Curator.

METEOROLOGY.—*Statistics of Station*:—Longitude, $1^{\circ} 5' W.$; Latitude, $53^{\circ} 57' N.$; height above mean sea level, 56 feet.

Several features of unusual interest to the meteorologist marked the year 1911, especially in regard to the heat and brilliancy of the summer and the heavy rains of the autumn.

Temperature ranged in 1911 between $19^{\circ} F.$ and $90^{\circ} F.$, the average mean temperature for the year being 50.1° as compared with 48.7° for 1910. The lowest temperature was recorded on Feb. 1st, when the absolute minimum thermometer registered $19^{\circ} F.$, while the highest reading was observed on the 9th of August, the record being $90^{\circ} F.$ The high readings were continued through June, July, August, and well into Sept.

A Mean Pressure of 29.965 has been recorded as against 29.848 inches for 1910. December was lowest with 29.641 inches, November next with 29.660 inches. July was highest with 30.087 inches, January next with 30.223 inches, the high

barometer coinciding with the unbroken fine summer. The extreme range of pressure was 2.006 inches, as compared with 2.070 inches in 1910 and 2.377 inches in 1909. The highest reading 30.744 inches was taken on January 31st, at 9 p.m., the lowest 28.738 inches on November 19th, at 9 a.m.

Rain or Snow (0.005 inches or more) fell on 183 days, 24 fewer than in 1910, and 42 fewer than in 1909, and the total amount was 25.06 inches as compared with 24.64 inches for 1910 and 24.75 inches for 1909. Practically 12 inches, or 47.5 % of this amount, fell in the last quarter of the year. December, November, and June proved to be our wettest months, with totals respectively of 3.71, 3.19, and 3.50 inches of rain. In the first four months of the year only 4.49 inches fell, February defying its name "fill-dike" with 0.87 inch.

The cumulative totals for the wettest months since 1841 are now October 191.06 inches, August 188.41 inches, July 175.11 inches. The heaviest fall occurred on June 24th, when 1.34 inches fell.

Observations of winds show that during 1911 we have had "strong" winds on 50 days, and only 3 "calms." The chief winds have been S. (286), W. (222), N. (209), N.W. (105), N.E., (84), S.W. (86).

We have had 52 days of "clear" sky, against 40 in 1910, 122 days of "overcast" as against 127 for 1910. We have had 9 thunderstorms and 17 fogs. Snow fell on 10 days as against 15 for 1910, and 31 for 1909.

Bright sunshine was observed for 1411 hours as against 1229 for 1910, representing 32 % of what was possible, and being a further improvement on the 28 % of 1910.

It is worth recording here that August 9th was the *hottest day ever observed in this country*, 100° F. being registered at Greenwich on a sheltered thermometer. Also the duration of bright sunshine was everywhere in excess, representing about 121 % of the normal. It is rarely possible to find such contrasts as the periods of absolute drought, July 1st—23rd, and August 2nd—18th, and the almost continuous wet from October 18th to December 31st.

NUMISMATICS.—The Hon. Curator reports that the collections are in good order, though but few additions have been made during the past year.

THE OBSERVATORY.—This remains in good repair and working order, as regards the instruments themselves, but it should be pointed out that the almost constant presence of a lighted stove in the winter time is quite inconsistent with the use of the equatorial telescope for observations. Equality of temperature between the air inside the observatory and the air outside is absolutely essential if a telescope is to be used at all. A fire once a week, on Sundays for instance, should be enough for keeping the building dry and aired.

ORNITHOLOGY.—The collections are in good order, and additions are continually being made to the mounted specimens, skins and eggs, and to the aviaries in the gardens.

ZOOLOGY.—The collection of Yorkshire mammals is slowly but surely increasing, and several additions have been added to the skin cabinet. The American Grey Squirrels, presented by Mr. St. Quintin over a year ago, are still at large in the Gardens and are a source of great interest to our members and visitors.

FIELD NATURALISTS' SECTION.—Your Committee have to report a slight improvement in the interest taken in the work of this section, the meetings have been fairly well attended, and some enthusiasm has been shown in the discussions which have followed several of the Lectures and Papers. During the past summer a number of field excursions were held, 22 members attended the outing to Moreby and Stillingfleet, 16 the one to Aldby Park, and 16 went to Lutton Woods.

The Winter Session was opened by a lecture on "The Badger," by Mr. C. F. Proctor, this being followed by a lantern lecture by Mr. Oxley Grabham, M.A., on "British Freshwater Fishes." The most largely attended lecture was that held at the house of the President, Dr. Tempest Anderson, F.G.S., when that gentleman gave as his presidential

address a beautifully illustrated description of Volcanic Craters and Explosions. Mr. C. E. Elmhirst lectured upon "The Salmon and Salmon Fishing." "Wild Life on a Yorkshire Moor" was the subject of a lecture by Mr. E. W. Taylor. Numerous exhibits were brought to the meetings by Messrs. F. W. Lockwood, J. H. Evers, H. J. Wilkinson, and V. Zimmermann. Some excellent ten-minute papers were read by Mr. J. H. Evers on the "Year's Botanical Work," Mr. F. W. Lockwood on "The Coasts and Glens of Antrim," and Mr. T. J. Martin "An Afternoon at a Pond side." Another good paper was that by Mr. Geo. Machin on "The Thrush Tribe," and Mr. Wm. Bellerby dealt with "Vegetable Psychology," and the last lecture of the season was by Mr. S. H. Smith, entitled—"Photographic Snapshots."

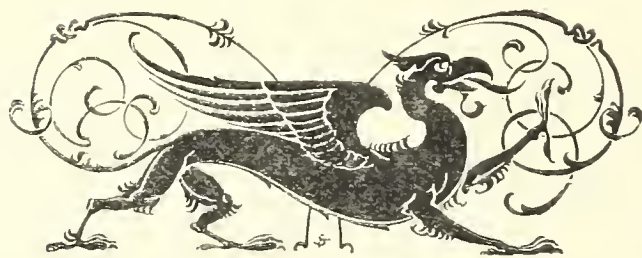
The Recorder's reports have been well done, but the only new record for the district is the discovery of the nesting of the Water Vole above ground at Skipwith. Photographs were taken, and the subject is described in the *Naturalist* of January, 1912. The Treasurer, Mr. H. Stansfield, in his annual financial statement, states that the total income, including balance from last year amounts to £48 18s. 7d., the expenditure £12 5s. 7d., leaving a balance in hand of £36 13s. 0d. During the past year 8 new members have been elected, 8 have resigned, and with 3 deceased, leaves a total membership of 79, a slight decrease on last year.

The resignation of Mr. S. H. Smith from the office of Hon. Secretary, has been accepted with regret, and the Council desire to place on record their appreciation of Mr. Smith's services to the York and District Field Naturalists. Dr. Tempest Anderson was re-elected President for the ensuing year.

THE PHOTOGRAPHIC SECTION.—The number of members of the section continues much the same as it has done for the last few years, namely about 30. During the Session which ended 30th Sept., 1911, several extremely good lectures were given. These included the Inaugural Address by the President, Dr. Tempest Anderson, on the volcano, "Matavau,"

The other lectures were "The Bromoil Process," by Harold Crawford, of Leeds; "Colour Photography," by A. A. Pearson, of Leeds, and "Photogravure," by Herbert Denison, of Leeds. In addition, there was the Annual Exhibition of Lantern Slides given by the Section to the Members and Associates of the Yorkshire Philosophical Society, which, as usual, was not only interesting but very well attended.

If the Members of the Yorkshire Philosophical Society were to take a greater interest in the affairs of the Section by inducing the younger members of their families to join, it would add greatly to its success and usefulness. Full particulars as to the terms of membership as well as other information will be readily furnished by the Secretary,



METEOROLOGICAL STATION, YORK.—THE MUSEUM.

Longitude 1° 5' W., Latitude 53° 57' N. Height above Mean Sea Level 56 ft. Gravity Correction + .024 in.

1911.	Mean Pressure at 32° Fahrenheit.		Air Temperature.										Humidity.						Earth Temp.							
	At M. S. Level	At Station Level.	9 a.m.	9 p.m.	Mean.	Means of		Min. & Max. Com- bined.	Absolute Max. and Min.				Depn. of Wet Bulb.			Tension of Vapour.			Percentage.			At 1 ft.	At 4 ft.			
						Max.	Min.		Max.	Min.	Day.	Min.	Day.	9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.	Mean.	9 a.m.	9 p.m.			Mean.		
	ins.	ins.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°			
Jan.	30.282	30.223	37.7	38.4	38.05	44.2	34.3	39.3	54	25	20th	25	1.1	1.3	1.2	.205	.206	.205	.205	.206	.205	90	89	89	38.9	42.3
Feb.	30.070	30.012	39.5	40.9	40.2	46.4	35.5	41.0	57	18th	1st	19	1.7	1.9	1.8	.209	.216	.212	.209	.216	.212	86	85	85	39.1	41.2
Mar.	29.948	29.890	41.0	39.3	4.01	46.1	36.3	41.2	56	3rd	13th	30	2.5	1.8	2.1	.206	.206	.206	.206	.206	.206	81	86	83	41.1	42.2
April	29.977	29.919	45.9	45.2	45.5	52.9	39.9	46.4	61	21st	5th	29	3.0	2.9	2.9	.244	.237	.240	.244	.237	.240	79	79	79	44.4	43.6
May	29.999	29.941	56.9	53.5	55.2	64.8	46.8	55.8	77	27th	1st	38	5.3	3.8	4.5	.319	.309	.314	.319	.309	.314	68	75	71	52.3	48.5
June	29.960	29.902	59.5	54.6	57	66.8	48.9	57.9	81	5 & 8	10, 13	40	5.1	3.0	4	.359	.345	.352	.359	.345	.352	70	81	75	58.0	54.2
July	30.143	30.087	65.3	61.3	63.3	74.6	53.5	64.1	86	21st	3 & 10	43	6.6	5.1	5.8	.407	.385	.396	.407	.385	.396	66	71	68	61.3	56.8
Aug.	29.993	29.935	64.8	61.8	63.3	73.1	55.6	64.4	90	9th	17th	44	5.2	3.7	4.4	.439	.432	.435	.439	.432	.435	72	79	75	62.9	59.5
Sept.	30.037	29.979	56.3	54.0	55.1	66.1	47.4	56.8	80	11th	22nd	37	3.8	2.8	3.3	.349	.339	.344	.349	.339	.344	76	81	78	57.6	58.0
Oct.	29.916	29.858	48.4	47.7	49	55.1	42.8	49.0	62	18th	29th	29	2.0	1.7	1.8	.291	.289	.290	.291	.289	.290	86	88	87	51.5	54.0
Nov.	29.660	29.603	41.5	42.0	41.7	47.9	38.0	43.0	58	5th	21, 29	30	1.9	1.7	1.8	.223	.231	.227	.223	.231	.227	86	87	86	44.8	49.2
Dec.	29.641	29.583	41.3	41.6	41.4	46.3	38.0	42.2	53	17, 18 28	30th 8th	31	1.1	1.4	1.2	.236	.233	.234	.236	.233	.234	92	90	91	41.4	45.0
Year	29.969	29.911	49.8	48.4	48.4	57.0	43.1	50.1	90	Aug. 9th	Feb. 1st	19	3.3	2.6	3.3	.291	.286	.288	.291	.286	.288	79	83	83	49.4	49.5

STATION, YORK.—THE MUSEUM.

Heights above Ground :—Barometer, 3 feet ; Thermometers, 4 feet ; Rain-gauge, 1 foot.

Amount of Cloud.			Rainfall.		Weather, No. of Days of										Wind, No. of Observations of									
9 a.m.		9 p.m.	Mean	Total.	Max.	Day.	Rain.	Snow.	Hail.	Thunder	Clear	Over-cast.	Fog.	Gale.	Calm.	Strong (Wind 4-7)	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
1911.				ins.	ins.	2nd, 6th	13	3	0	0	4	16	3	0	0	3	11	5	3	7	23	10	27	7
Jan.	7.1	6.3	6.7	1.36	0.32	21st	12	0	0	0	2	14	1	0	0	18	7	0	2	2	19	3	30	21
Feb.	7.1	6.7	6.9	0.87	0.21	13th	18	4	0	0	2	17	1	0	0	8	30	14	19	2	9	6	7	6
Mar.	7.0	7.7	7.3	1.19	0.31	4th	14	2	0	0	2	9	0	0	0	5	26	6	0	1	15	8	28	6
April	7.3	6.2	6.7	1.07	0.21	13th	9	0	1	1	7	9	0	0	0	0	21	15	6	3	19	2	19	8
May	5.7	5.6	5.6	2.32	1.28	24th	12	0	0	2	7	8	0	0	0	2	18	10	8	2	15	10	19	8
June	5.3	5.2	5.1	3.50	1.34	2nd	9	0	1	3	5	4	0	0	0	0	6	11	3	0	25	5	28	15
July	5.1	4.3	4.7	1.02	0.27	20th, 27th	13	0	0	1	6	7	0	0	0	0	19	8	3	3	36	10	8	6
Aug.	5.5	5.2	5.3	1.84	0.39	12th	11	0	1	1	8	4	0	0	2	3	15	3	1	3	20	3	25	18
Sept.	4.4	4.4	4.4	2.58	0.63	26th	16	0	0	1	4	11	7	0	1	6	30	5	12	7	21	5	5	7
Oct.	6.1	7.1	6.6	2.41	0.62	21st	24	1	0	0	2	13	3	0	0	5	24	5	3	4	30	9	13	2
Nov.	6.3	7.1	6.7	3.19	0.44	13th	22	0	0	0	3	10	2	0	0	0	2	2	3	3	54	15	13	1
Dec.	6.5	6.3	6.4	3.71	0.56																			
Year	6.1	6.0	6.05	25.06	1.34	June 24	173	10	3	9	52	122	17	0	3	50	209	84	63	37	286	86	222	105

RIVER HEIGHT RECORDS REGISTERED BY THE AUTOMATIC RECORDER
AT THE GUILDHALL, YORK, 1911.

Date.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.	
	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.
1	1 a.m.	ft. in. 1	noon	ft. in. 0	11 a.m.	ft. in. 7	noon	ft. in. 0	1 a.m.	ft. in. 1	noon	ft. in. 0
2	7 a.m.	1	"	0	12 p.m.	5	"	0	"	0	"	0
3	12 p.m.	1	"	0	"	2	6 p.m.	0	10 p.m.	1	"	0
4	6 a.m.	1	"	0	"	3	noon	0	4 p.m.	4	"	0
5	1 a.m.	0	"	0	7 a.m.	4	"	0	1 a.m.	3	"	0
6	12 p.m.	1	"	0	12 p.m.	1	"	0	"	1	"	S.L.
7	4 p.m.	2	"	0	6 p.m.	0	"	0	"	0	"	S.L.
8	12 p.m.	3	"	0	noon	0	12 p.m.	1	"	0	"	S.L.
9	9 a.m.	5	"	0	12 p.m.	1	6 a.m.	1	"	0	"	S.L.
10	1 a.m.	3	"	0	11 a.m.	1	1 a.m.	0	"	0	1 a.m.	S.L.
11	12 p.m.	2	"	0	1 a.m.	1	12 p.m.	0	"	0	1 a.m.	S.L.
12	noon	4	"	0	12 p.m.	1	noon	0	"	0	noon	S.L.
13	1 a.m.	2	6 p.m.	0	10 p.m.	1	"	0	12 p.m.	0	below	2
14	"	1	noon	0	10 a.m.	1	"	0	"	0	"	0
15	12 p.m.	1	12 p.m.	0	1 a.m.	1	"	0	"	1	"	0
16	"	2	"	1	12 p.m.	1	"	0	"	0	"	0
17	"	1	2 p.m.	4	"	2	"	0	1 a.m.	0	6 p.m.	0
18	"	1	1 a.m.	3	"	2	"	0	noon	0	noon	S.L.
19	"	1	6 p.m.	7	noon	1	"	0	"	0	9 p.m.	above
20	"	0	1 a.m.	6	1 a.m.	1	"	0	"	0	1 a.m.	4
21	noon	0	"	1	"	1	"	0	"	0	"	0
22	12 p.m.	0	12 p.m.	7	"	1	2 p.m.	1	6 p.m.	S.L.	noon	0
23	"	0	9 p.m.	4	"	1	11 p.m.	1	noon	0	"	S.L.
24	"	1	2 p.m.	8	9 p.m.	1	noon	1	"	0	1 a.m.	S.L.
25	"	2	1 a.m.	7	noon	1	7 p.m.	0	"	0	"	0
26	10 a.m.	2	12 p.m.	2	6 a.m.	1	8 p.m.	2	6 a.m.	0	"	4
27	12 p.m.	1	"	1	noon	0	12 p.m.	1	12 p.m.	S.L.	1 p.m.	3
28	"	1	12 p.m.	5	"	0	noon	1	noon	S.L.	12 p.m.	1
29	"	0	"	0	"	0	12 p.m.	1	12 p.m.	0	3 p.m.	0
30	noon	0	"	0	"	0	noon	2	6 a.m.	0	12 p.m.	0
31	"	0	"	0	"	0	"	2	noon	0	"	0

RIVER HEIGHT RECORDS.—Continued.

Date.	JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.	Time.	Above or below S.L.
1	10 p.m.	ft. in. 0 6	noon	below 0 5	6 p.m.	below 0 10	6 a.m.	above 0 10	1 a.m.	ft. in. 5 10	12 p.m.	ft. in. 1 9
2	noon	0 6	"	0 5	5 p.m.	0 8	1 a.m.	0 6	"	1 10	"	1 3
3	6 p.m.	0 2	"	S.L.	noon	0 5	"	0 1	4 p.m.	2 3	"	2 0
4	noon	0 2	"	S.L.	6 p.m.	0 7	noon	below 0 2	12 p.m.	3 5	"	1 5
5	1 a.m.	0 2	"	0 6	noon	0 6	"	0 3	"	5 6	"	2 0
6	noon	S.L.	1 a.m.	0 3	"	0 6	"	0 3	"	1 9	noon	2 7
7	7 p.m.	below 0 2	6 a.m.	above 0 4	"	0 6	"	0 4	3 p.m.	3 2	12 p.m.	5 6
8	noon	0 2	5 a.m.	0 9	"	0 6	"	0 3	12 p.m.	3 2	3 a.m.	5 9
9	"	0 2	1 a.m.	0 3	"	0 6	"	0 4	"	2 2	9 a.m.	2 7
10	"	0 2	12 p.m.	below 0 4	"	0 7	12 p.m.	0 6	"	0 8	12 p.m.	4 1
11	"	0 1	noon	0 4	6 p.m.	0 9	noon	0 5	1 p.m.	0 4	"	9 4
12	"	0 2	"	0 5	1 a.m.	0 9	"	0 5	12 p.m.	0 9	"	7 5
13	"	0 2	"	0 5	noon	0 6	"	0 5	"	3 9	"	3 6
14	"	0 2	3 p.m.	0 7	12 p.m.	0 1	"	0 5	5 p.m.	1 7	"	4 3
15	"	0 2	noon	0 5	8 p.m.	0 4	"	0 5	noon	3 6	"	7 6
16	6 p.m.	0 3	noon	0 5	5 p.m.	0 7	"	0 6	9 p.m.	4 9	2 p.m.	8 7
17	noon	0 2	"	0 5	noon	0 5	"	0 5	12 p.m.	2 7	1 a.m.	8 3
18	5 p.m.	0 4	"	0 5	"	0 6	"	0 5	noon	3 0	12 p.m.	4 8
19	noon	0 3	"	0 5	9 a.m.	0 8	10 a.m.	0 7	1 a.m.	2 7	3 p.m.	7 5
20	"	0 3	"	0 5	noon	0 5	noon	0 4	12 p.m.	6 2	1 a.m.	6 8
21	"	0 3	"	0 3	"	0 5	"	0 5	"	3 3	noon	5 10
22	"	0 4	"	0 5	"	0 5	1 a.m.	0 4	"	1 7	12 p.m.	2 4
23	"	0 4	"	0 4	"	0 5	6 p.m.	above 0 3	9 a.m.	1 3	10 a.m.	1 6
24	6 p.m.	0 6	"	0 6	"	0 5	12 p.m.	0 6	11 p.m.	1 0	12 p.m.	2 0
25	noon	0 5	1 a.m.	0 4	"	0 6	12 p.m.	0 11	11 a.m.	0 8	2 p.m.	5 1
26	"	0 4	noon	0 5	"	0 5	7 p.m.	0 6	1 a.m.	0 11	11 a.m.	2 10
27	"	0 4	"	0 5	4 p.m.	S.L.	12 p.m.	3 8	12 p.m.	1 6	6 p.m.	3 9
28	"	0 4	"	0 6	10 p.m.	0 3	3 a.m.	3 9	2 p.m.	2 5	12 p.m.	2 2
29	"	0 4	1 a.m.	0 4	6 p.m.	0 1	1 a.m.	1 1	12 p.m.	1 5	"	2 6
30	"	S.L.	noon	0 2	noon	0 2	12 p.m.	6 9	5 p.m.	1 2	10 p.m.	2 6
31	"	S.L.	"	0 3	6 p.m.	0 2	11 a.m.	8 4	12 p.m.	1 10	12 p.m.	1 10

HOUSE FLOODS FROM RETURNS TO THE CITY SURVEYOR.
COMPARATIVE TABLE, 1911.

Date.	Nidd at Pateley Bridge.		Ure at Middleham Bridge.		Swale at Richmond.	
	Hour.	Height.	Hour.	Height.	Hour.	Height.
		ft. in.		ft. in.		ft. in.
Jan. 8			3 p.m.	8 0		
" 11			5 p.m.	8 6		
May 2			8 p.m.	2 0		
" 3			8 a.m.	3 0		
Oct. 27			10 a.m.	5 6		
" 30			5 p.m.	12 6	10-30 a.m.	4 0
Nov. 3					12 p.m.	2 0
" 4			10 a.m.	4 0	9 a.m.	1 8
" 5			4 p.m.	6 0	4-30 a.m.	3 0
" 8			7 a.m.	8 0		
" 14			6 p.m.	7 6		
" 15			8 a.m.	4 0		
" 16			7 a.m.	8 0	4-30 a.m.	3 6
" 20					7 a.m.	3 0
Dec. 3			8 a.m.	3 0		
" 7			10 a.m.	7 6	4-30 a.m.	2 0
" 10			4 p.m.	8 0	5-30 p.m.	5 0
" 15					3 p.m.	2 9
" 18			10 p.m.	9 0		
" 19			8 a.m.	4 0		

YORK—THE MUSEUM.
 BAROMETER AT 32° AND M.S.L.

1911.	Highest Barometer.	Lowest Barometer.
January	30·744 31st, 9 p.m.	29·585 11th, 9 p.m.
February	30·809 1st, 9 p.m.	28·905 23rd, 9 p.m.
March	30·329 25th, 9 p.m.	29·445 13th, 9 a.m.
April	30·442 8th, 9 p.m.	29·185 29th, 9 a.m.
May	30·327 28th, 9 p.m.	29·555 3rd, 9 p.m.
June	30·575 6th, 9 p.m.	29·301 24th, 9 p.m.
July	30·648 10th, 9 a.m.	29·582 18th, 9 a.m.
August	30·290 14th, 9 a.m.	29·624 21st, 9 a.m.
September	30·357 16th, 9 a.m.	29·335 20th, 9 p.m.
October	30·595 10th, 9 a.m.	28·805 26th, 9 p.m.
November	30·385 29th, 9 p.m.	28·738 19th, 9 a.m.
December	30·326 31st, 9 p.m.	28·809 11th, 9 p.m.
Year	30·744 Jan. 31st, 9 p.m.	28·738 Nov. 19th, 9 a.m.

YORK (BOOTHAM)—SUNSHINE VALUES.

Month.	Total Hours.	Percentages.	
	1911.	1911.	1910.
January	28	12	19
February	48	18	22
March	85	23	34
April	99	24	22
May	172	35	32
June	198	39	33
July	255	50	28
August	174	38	30
September	186	50	30
October	81	25	29
November	63	25	32
December	22	10	11
Year	1411	32	28

THE TREASURER'S ACCOUNT IN CONNECTION WITH THE FUND FOUNDED BY THE LATE
WM. REED, ESQ., FOR SPECIFIC PURPOSES.

Dr.		INCOME.		EXPENDITURE.		Cr.
			£ s. d.			£ s. d.
Interest on £600 York Corporation 3% Redeemable Stock, less Income Tax	16 19 0	Books and Binding	..	..
Interest on £50 placed on Deposit with the London Joint Stock Bank Ltd.	1 5 0			18 4 0
			<u>£18 4 0</u>			<u>£18 4 0</u>
BALANCE SHEET.						
Amount of Fund on 30th December, 1911		..	687 19 2	Amount invested in York Corporation 3% Redeemable Stock		600 0 0
				Amount placed on Deposit with the London Joint Stock Bank Ltd.		50 0 0
				Cash at Bankers in General Account		37 19 2
			<u>£687 19 2</u>			<u>£687 19 2</u>

xxi.

10th February, 1912.

Examined and found correct,

PHILIP L. MEWMAN.

E. GRAY, Hon. Treasurer.

THE TREASURER IN ACCOUNT WITH THE YORKSHIRE

Dr.

INCOME.

Subscriptions :

	£	s.	d.	£	s.	d.
Town Members	634	0	0			
Country Members	11	0	0			
Lady Subscribers	65	0	0			
Associates	15	10	0			
Arrears received	20	5	0			
Keys of Gates	67	12	6			
				813	2	6

Rents :

Major Allenby, St. Mary's Lodge ¹	65	0	0			
Mr. Hill, Marygate Baths	40	0	0			
York Amateur Rowing Club	5	0	0			
York and District Field Naturalists' Society, less £2 paid to Attendant	1	0	0			
York Waterworks Co., for Shed	22	10	0			
Do. for Light	0	1	0			
Corporation of York—Lease of Exhibition Land	2	0	0			
Yorkshire School for the Blind, for Light	0	1	0			
Post Office, Wayleaves	0	2	0			
National Telephone Co., for Wayleave	1	0	0			
York University Extension Society—Use of Lecture Room	2	2	0			
				138	16	0

Whitsuntide Admission Fees	9	6	6			
Less : Attendants	3	6	0			
Fixing of Barricades	2	7	4			
	5	13	4			
				3	13	2

Sale of Catalogues, Plans and Photographs				4	13	0
Bank Interest				6	11	6
Gate Money				234	5	6
Interest on £918 8s. 9d. India 3% Stock, less Income Tax				25	19	0
Sale of Timber				0	15	0
Hire of Tent and Tables	8	5	0			
Less : Cost of Repairs, Carriage, Fixing, etc.	2	3	7			
				6	1	5

Meteorological Department—Grant from Corporation of York				5	0	0
--	--	--	--	---	---	---

	1239	2	1			
Excess of Expenditure over Income	48	9	8			
	1287	11	9			

Balance in hands of the Treasurer, 30th December, 1911	179	13	5			
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£179 13 5

Examined and found correct,

PHILIP L. NEWMAN.

E. GRAY,

10th Feb., 1912.

Hon. Treasurer.

PHILOSOPHICAL SOCIETY FOR YEAR ENDING 30TH DEC., 1911.

EXPENDITURE.						Cr.								
						£	s.	d.	£	s.	d.	£	s.	d.
Crown Rent	...	...	...	...	...							1	0	0
Corporation Rent	...	...	...	...	...							18	19	7
<i>Rates and Taxes :</i>														
Property Tax and City Rates	...	...	...	...	...				47	3	3			
Waterworks Company's Rate	...	...	...	...	...				14	4	6			
Gardeners' Licenses	...	...	...	...	...				2	5	0			
Receipt and Cheque Books Stamping	...	...	...	...	...				1	4	8			
												64	17	5
<i>Insurance :</i>														
Fire Premium	...	...	...	...	...				7	5	0			
Employers' Liability Premium	...	...	...	...	...				2	7	0			
												9	12	0
<i>Salaries and Wages :</i>														
Museums	...	...	...	...	...				336	4	0			
Lodge and Gardens	...	...	...	...	...				303	16	11			
												640	0	11
*Yorkshire Insurance Company Ltd., Annuity...												132	1	2
<i>General Additions, Repairs, and Expenses :</i>														
Museums	...	...	...	...	...				27	6	0			
Gardens	...	...	...	...	...				51	5	7			
Estate : New Lavatory Accommodation	...	...	...	...	...	65	0	0						
Heating Apparatus in Museum	...	...	...	...	...	75	0	0						
General Repairs	...	...	...	...	...	17	13	1						
												157	13	1
												236	4	8
Library—Books and Binding	...	...	...	...	...							4	5	0
Lectures	...	...	...	...	...							26	19	2
Printing and Stationery	...	...	...	...	...							12	0	7
Printing Communications to Members and	...	...	...	...	...				
Postage of same	...	...	...	...	...							3	18	9
Printing Reports and Postage thereof	...	...	...	...	...							40	11	5
<i>Gas, Coal, and Coke :</i>														
Museums	...	...	...	...	...				39	9	3			
Gardens	...	...	...	...	...				16	4	9			
Estate	...	...	...	...	...				19	5	3			
												74	19	3
Antiquities, Coins and Pottery	...	...	...	...	...							13	1	11
Sundry Postages	...	...	...	...	...							7	18	10
Sundries	...	...	...	...	...							1	1	1
												£1287	11	9
<hr/>														
Balance in hands of the Treasurer, 31st December, 1910	...	...	...	...	...							228	3	1
Excess of Expenditure over Income, 1911	...	...	...	...	...							48	9	8
												£179	13	5

* Annuity payable until October, 1914, inclusive, created to repay an advance of £3500 made by the Yorkshire Insurance Co. Ltd.

Principal repaid	...	...	3127	3	5
„ outstanding	...	...	372	16	7
			<u>£3500</u>	<u>0</u>	<u>0</u>

NEW MEMBERS, &c., ELECTED, 1911.

- Archer, A. B., 29, Feversham Crescent.
 Ayres, Arthur, 27, St. Mary's.
 Bartley, Albert, 59, Low Petergate.
 Bengough, C. F., Mount Villas.
 Brooke, W. Harvey, 26, East Mount Road.
 Bullivant, Mrs., Feasegate.
 Dodsworth, B., Minster Yard.
 Evans, Alfred, 3, Sycamore Terrace.
 Fox, Rev. N. Storrs, Holy Trinity Rectory.
 Green, Frank, Treasurer's House.
 Greenwood, H. C., The Gables, Sycamore Place.
 Hame, J. W., "Newstead," Burton Lane.
 Harrison, Mrs., 13, Portland Street.
 Hick, Wm., Museum Street.
 Hughes, G. S., F.R.C.S., 6, St. Leonard's.
 Hutton, John, Sowber Gate, Northallerton.
 Kennedy, Geo. A., 1, Grove View, Clifton.
 Knocker, Mrs., 7, Minster Yard,
 Meysey-Thompson, Col. R. F., Nunthorpe Court.
 Neill, Geo., 24, Bootham Crescent.
 Parry, Major W., 31, The Mount.
 Pollock, G. H., M.R.C.V.S., Tower Street.
 Procter, Chas. F., 74, Gillygate.
 Puckering, W. E., 1, Market Street.
 Rawling, F. P., St. Andrewgate.
 Richardson, Col. J. W., 32, St. Mary's.
 Saltmarshe, Harold, 9, Minster Yard.
 Spencer, Major C. G., R.A.M.C., Dudley Cottage, Fulford.
 Tate, Mrs., 42, Blossom Street.
 Thorpe, R. S., 100, Holgate Road.
 Thurgood, T., 1, Bridge Street.
 Turner, Fredk. W., 25, Avenue Terrace.
 Turner, Geo., 3, St. Nicholas Terrace.
 Widdicombe, J., River View, Marygate.
 Wood, J. C., 82a, Bootham.
 Young, W. Wesley, 22, Grosvenor Terrace.

LADY SUBSCRIBERS.

Baker, Mrs., Minster Yard.
 Baker, Miss, 1, Friargate.
 Clarkson, Mrs., 30, Grosvenor Terrace.
 Derby, Miss C. A., 1, Bootham Terrace.
 Green, Miss C., 3, Minster Gates.
 Munby, Miss, 11, St. Mary's.
 Noble, Miss, Sycamore Villas.
 Powell, Mrs. 14, Grosvenor Terrace.
 Smith, Miss S., 46, Marygate.
 Sykes, Mrs. M., 51, Stonegate.
 Taylor, Mrs. M.

ASSOCIATES.

Anderson, Arthur, 44, Coney Street.
 Davis, J. J., Archbishop Holgate's School.
 Kitching, J., 17, Sycamore Place.
 Teasdale, Reginald, Lendal.

DEATHS, 1911.

MEMBERS.

Border, S., Grimston.
 Brode, Rev. T. A., Nunthorpe Avenue.
 Brown, Arthur, Monkgate.
 Bullivant, M. R., Feasegate.
 Cobb, W. H., Southwood Hall.
 Davis, Mrs., Bootham Terrace.
 Demaine, J., St. Peter's Grove.
 Hudson, A. A., Redworth House, Clifton.
 Jones, G. H. Fowler, Park Street.
 Rieveley, J. W., Colliergate.
 Tate, John, 42, Blossom Street.
 Young, Rev. J. E. M., St. Saviourgate.

LADY SUBSCRIBERS.

Palmes, Mrs., Bootham Terrace.
 Pattison, Miss, Bootham.
 Richardson, Mrs. Hy., Cherry Hill House.
 Routledge, Mrs., St. John's Crescent.

RESIGNATIONS.

Members, 25. Lady Subscribers, 6. Associates, 2.

DONATIONS TO MUSEUM AND LIBRARY.

LIBRARY.

BOOKS PRESENTED.	DONOR.
The Quarterly Journal of the Geological Society of London, Vol. lxxvii., 1911.	The Society.
Transactions of the Royal Society of Edinburgh, Vol. xlv. Parts 1, 2; Vol. xlvii. Parts 3, 4. Proceedings, Vol. xxx. Part 7; Vol. xxxi. Parts 1, 2, 3, 4, 5.	The Society.
Philosophical Transactions of the Royal Society, Series A., Vol. ccx. Series B., Vol. cci. Proceedings, Series A., Vol. lxxxiv., Nos. A, 573, 574, 575; Vol. lxxxv., 576, 577, 578, 579, 580, 581, 582; Vol. lxxxvi., 583, 584, 585, 586. Series B., Vol. lxxxiii., Nos. B, 563, 564, 565, 566, 567; Vol. lxxxiv., Nos. 568, 569, 570, 571, 572, 573, 574.	The Rev. Prof. T. G. Bonney.
Catalogue of the Marine Reptiles of the Oxford Clay. Part 1 of Freshwater Fishes of Africa. Vol. ii. The Flora of Jamaica. Vol. i. (Orchids) of the British Lichens. Part 2 of the Lepidoptera Phalænæ, Vol. x. and plates. Handbook of the Tsetse Flies and Guide to Mr. Worthington-Smith's drawings of Field and Cultivated Mushrooms and other Fungi.	The Trustees of the British Museum.

- Memoirs of the Geological Survey of India "Palæontologia Indica," Series xv., Vol. iv., Part 3. Records, Vol. xl., Parts 1, 2, 3, 4. } The Survey.
- Transactions of the Zoological Society of London, Vol. xviii., Part 4, and Proceedings for 1911. } The Society.
- Annual Report of the United States Geological Survey, No. 31 and Monograph, Vol. lii. Bulletins, Nos. 391, 420 to 495. Professional Papers, No. 70, 72, 73, 75. Mineral Resources, Part 1, Metals; Part 2, Non-metals. Water Supply Papers, Nos. 240 to 277. } The United States Survey.
- Bulletin of the Bureau of American Ethnology, No. 30, Part 2 No. 40, Part 1, 43, 44, 50, 51. Annual Reports 1905-6, 1909-10. Handbook of American Indians and Report of the United States National Museum for 1910. } The Institution.
- Bulletin of the American Geographical Society, Vol. xlii., No. 12; Vol. xlii., Nos. 1—12. } The Society.
- Transactions of the Linnean Society of London Zoology, Vol. x., Part 10. Vol. xi., Parts 6, 7; Vol. xiii., Part 4; Vol. xiv., Parts 1, 2, 3. Botany, Vol. vii., Part 15. Journal, Zoology, Vol. xxxi., No. 208; Vol. xxxii., Nos. 211, 212. Botany, Vol. xxxix., Nos. 273, 274; Vol. xl., Nos. 275, 276. } Dr. Tempest
Anderson.
- Report of the British Association for the Advancement of Science, Sheffield, 1910. } The Association.

- Proceedings of the Royal Institution of
Great Britain, Vol. xix., Parts 1, 2. } The Institution.
- Memoirs of the Russian Geological
Society, Nos. 53, 54, 55, 56, 57, 60,
66, 68. Bulletin, Vol. xxviii., Nos.
9, 10; Vol. xxix., Nos. 1—10. } The Society.
- An Account of the Crustacea of Norway,
Vol. v., Parts 31—36, by Prof. G. O.
Sars. } The Author.
- Historical Collections of Staffordshire,
1911, The William Salt Archæolog-
ical Society. } The Society.
- Proceedings of the Russian Mineralog-
ical Society for 1909. } The Society.
- 21st Report of the Missouri Botanic
Garden, 1910. } The Committee.
- Memoirs and Proceedings of the Man-
chester Literary and Philosophical
Society, Vol. lv., Parts 1, 2, 3. } The Society.
- Journal of the Manchester Geographical
Society, Vol. xxvi., Parts 1—4. } The Society.
- Manchester Museum Handbooks, Nos.
70, 71, and Report of Museum for
1910-11. } The Museum.
- Transactions of the Edinburgh Geo-
logical Society, Vol. ix., Part 5. } The Society.
- Bergen Museums Aarbog and Aars-
beretning for 1910 and 1911, 2 parts. } The Institution.
- Det Kongelige Norske Videnskabers
Selskabs Skifter, 1909-11, Oversigt
Det Kongelige Danske Forhand-
linger, 1910, No. 6. } The Society.
- Annual Report of the Department of
Mines of New South Wales for 1910. } The Department.

- Memoirs of the Department of Agriculture in India, Vol. iii., No. 6. } The Society.
Journal, Vol. vi., Part 1, and Index }
to Vol. v. and Report of Progress.
- Bulletins Nos. 15, 16, of the Illinois } The Survey.
State Geological Survey, and Year }
Book for 1909.
- Transactions and Proceedings of the } The Society.
Perthshire Society of Natural Science, }
Vol. v., Parts 2, 3.
- Transactions of the Wisconsin Academy } The Academy.
of Sciences, Arts and Letters, Vol. }
xvi., Nos. 1—6.
- A Descriptive Catalogue of the British } The Museum.
and Foreign Building Stones in the }
Sedgwick Museum, by John Watson.
- Annals of the New York Academy of } The Academy.
Sciences, Vol. xx., Parts 1, 2, 3 ; Vol. }
xxi., pages 1 to 175.
- Transactions of the Natural History } The Society.
Society of Glasgow, Vol. viii., New }
Series, Part 2, and Indices to the }
Transactions.
- Transactions of the Natural History } The Society.
Society of Northumberland, Durham, }
and Newcastle-upon-Tyne, Vol. iii., }
Part 3, and Report.
- Transactions of the Burton-on-Trent } The Society.
Natural History and Archæological }
Society, Vol. vi., 1911.
- Transactions of the Leicester Literary } The Society.
and Philosophical Society, Vol. xv., }
1911.
- University of Toronto Studies, Nos. 9, } The University.
36, 90, 91, 92, 93.

- Proceedings and Transactions of the
Croydon Natural History and Scientific Society, 1910-11. } The Society.
- Journal of the Northants Natural History Society and Field Club, Vol. xv.,
Nos. 121—124. } The Society.
- Journal of the Natural History Society
of Glasgow, Vol. iii., Nos. 1—4. } The Society.
- Memoirs of the Royal Academy of
Sciences and Letters of Denmark,
1910, and Bulletin Nos. 2—5. } The Academy.
- Bulletin of the Geological Institution
of Mexico, Nos. 27, 28: Vol. iii.,
Nos. 7—10. } The Institution.
- 6th Annual Report of the Meteorological
Committee for the year ending March
31st, 1911, and Report of the 9th
Meeting of the International Meteor-
ological Committee, Berlin, 1910, and
Weekly and Monthly Weather Re-
ports for 1911. } The Meteorological
Society.
- Semi-precious Stones of Carrick, by
John Smith. } The Author.
- Bulletin of the Lloyd Library, No. 18,
and Biological Notes. } The Library.
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zu Leipzig, 1910. } The Society.
- Anales del Museo Nacional de Monte-
video, Vol. vii., No. 4. } The Society.
- Verhandlungen der Naturforschenden
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- Proceedings of the Bristol Naturalists'
Society, 4th Series, Vol. ii., Parts 1, 2. } The Society.
- Annalen des K. K. Naturhistorischen
Hofmuseums, No. 24, 1910. } The Institution.

Journal of the Torquay Natural History Society, Vol. i. No. 3.	The Society.
The 16th Annual Report of the Moss Exchange Club, 1911.	W. Ingham.
Annual Report of the Medical Officer of Health, York, for 1910.	Dr. E. M. Smith.
Report and Proceedings of the Belfast Natural History and Philosophical Society, 1909-10, 1910-11.	The Society.
Hull Museum Publications, Nos. 78, 81, 82.	The Curator.
Report of the Colchester Museum of Local Antiquities, 1911.	The Museum.
Bulletin of the National Museum of Science and Art, Dublin, Part 1, January, 1911.	The Museum.
7th Report of the University of Leeds.	The University.
Calendar of the Armstrong College.	The College.

ZOOLOGY AND COMPARATIVE ANATOMY.

Two Canaries, and two Canary and Goldfinch Mules.	Mrs. Sherwood.
Three Canaries.	Misses Evelyn.
A pair of Japanese Teal Ducks and brace of Trout <i>fontinalis</i> .	F. B. Norcliffe.
Two American Grey Squirrels.	Mr. W. H. St. Quintin.

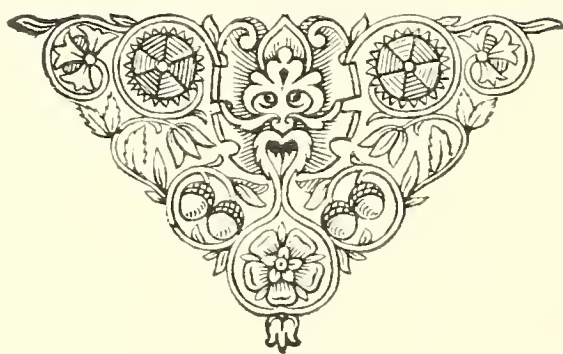
ANTIQUITIES.

Fragments of Roman Pottery.	Mr. Greenwood.
Two Silver Coins of William the Norman, found in York, July, 1845.	Mr. W. W. Hargrove.
Old Spur found in the Cemetery at Northallerton.	The Very Rev. the Dean of York.

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|--|---|--------------------------|
| Urn of Pre-historic Pottery and worked
Flints from Tumulus at Thornton
Dale. | } | Mr. R. Hill. |
| | | |
| Stamped Leather Sheath containing
bone pin found in Railway Street,
York, and various Coins. | } | Dr. Tempest
Anderson. |
| | | |
| Two Lead Absolution Crosses. | | The Lord Bolton. |
| Lead Bulla of Pope Gregory IX. found
in churchyard at Dringhouses. | } | Rev. E. W. Evans. |
| | | |

GEOLOGY.

- A small series of Fossils and Minerals. Mr. Greenwood.



THE
ROMAN POTTERY IN YORK MUSEUM.

By THOMAS MAY, F.S.A. (Scot.)

(Continued.)

PART III.

In addition to the works of the authorities cited in preceding sections, the following have been utilized in the preparation of this (No. III.) Section dealing with the plain clay-bodied wares:—

Poppelreuter and Hagen, *Bonn. Jahrb.*, 114-5, — *Jahrbuecher des Vereins von Altertumsfreunden im Rheinlande*, heft 114-115, 1906, Die römischen Gräber Kölns, by Joseph Poppelreuter: Ausgewählte römische Gräber aus Köln, by Joseph Hagen.

Behn, *Römische Keramik*.—*Kataloge des röm.—germanischen Central Museums*. No. 2, *Römische Keramik mit Einschluss der hellenistischen Vorstufen*, by Frederick Behn, 1910.

Die Altertümer unserer heidnischen Vorzeit. Articles by F. Reinecke, K. Schumacher, L. Lindenschmit, and Fr. Behn.

Gibson and Simpson, *Poltross-burn*.—The Mile-castle on the Wall of Hadrian at the Poltross-burn, by J. P. Gibson and F. Gerald Simpson. *Trans. Cumb. West. Antiq. and Arch. Society*, vol. XI., New series, 1911.

The Roman Era in Britain, by John Ward, 1911.

Drexel, *Faimingen*.—*ORL XXXV.*, No. 66c *Kastell Faimingen*, VI. Tongeschirr, by F. Drexel.

Löeschcke, *Sammlung Niessen*.—*Beschreibung römischer Altertümer gesammelt von Karl Anton Niessen*, Britischem Consul in Köln a. Rhein, 1911. Einführung in die Abteilungen Glas—Keramik—Terrakotten, by Siegfried Löeschcke.

A technical arrangement of types based on their glaze, colouring and shape implies a knowledge of the methods and materials of manufacture, together with clear definitions of form such as have been furnished by Déchelette, Löeschcke, Ritterling, Curle, &c., in their works already referred to.

It has now been ascertained, in regard to the principal ingredients and methods of glazing and colouring, that, by the employment of the oxides of copper and lead and the black and red oxides of iron,

the shades of enamel glaze produced during the I.—IV. centuries were moss-green, olive-green, grass-green, yellowish-green, citron-yellow, greyish-brown, red, copper-red, and black. Schumacher, *Altertumer u. h. Vorzeit*, p. 295, plate 52.

In describing the red glazed crockery found in this *castellum*, Drexel (*Faimingen*, p. 80) says: "The expression 'glazed' replaces the technically false one of 'varnished' hitherto mostly employed for this kind of ware."

The methods of glazing and colour-coating have been dealt with in the preceding section, of which the following is a revised summary:—

1. *Enamel glazing*.—The vessel in biscuit state (after first firing) is painted or coated with a frit, consisting of finely powdered vitrified clay, mixed in water with a powdered metallic oxide for colouring. It is then re-fired at a temperature only sufficient to vitrify the glaze.

2. *Red terra sigillata glaze*.—The vessel in biscuit state is dipped in a watery slip of the same kind of clay strongly coloured with red iron oxide and probably containing some kind of alkali. It is then re-fired at a sharp heat.

3. *Belgic black or terra nigra glaze*.—The biscuit ware is steeped in a thin solution of well levigated clay, and after drying and polishing (a) coated with powdered iron pyrites or steeped in a solution of green vitriol (copperas), and fired with bituminous fuel (Kimmeridge shale, pitch, &c.); * (b) coated with ruddle and fumed; or (c) coated with silicate of iron (ground iron, "bull dog," iron scale) and re-fired in the ordinary way.

4. *Hæmatite facing*.—(Prehistoric Egyptian or black topped ware). The leather hard or air dried vessel is polished, coated with hæmatite (ruddle) and baked upside down in an open wood fire,—the black top is the portion covered by ashes.

5. *Matt black colour coating*.—The biscuit ware is dipped in a clay slip containing "ground iron" and fired in the usual manner; or dipped in slip containing ruddle, and fumed.

6. *Slip coating*.—The air dried vessel is steeped in a slip (or engobe) of the same kind of clay, or clay of another colour, and fired in the usual manner.

* The discovery of black ferrous sulphide in the pre-historic terra nigra glaze is due to Mr. George Bowman, F.C.S., &c.

7. *Fuming*.—Vessels of ordinary brown-red clay (which contains 4 to 5 per cent. of red iron oxide), or which have been coated when in biscuit state with slip containing red iron oxide, are fired or re-fired in a smother-kiln producing fumes of carbon monoxide (carbonyl gas), whereby the clay body and red iron oxide in the slip are reduced to a uniform blue-grey to black colour.

By the last of these methods most of the plain clay utensils in ordinary use during the Roman period were rendered impervious to liquids and cleanly and antiseptic in use. Such wares are accordingly divisible into coated or uncoated, steeped or unsteeped, fumed or unfumed; and according to shape, into rounded (convex), conical and upright (straight-sided),—these regular shapes mostly of Roman or early Italian origin; or into hollow-sided (concave) S-shaped or ogee-sided, carinated (obtuse angled), acute-angled, constricted, cordoned, or into other fantastic forms of Late Celtic origin, such as those of the so-called Upchurch ware, which includes only a small and well defined series.

Belgic terra nigra, which is steeped in fine slip, black-coated and fumed, is distinguishable from the merely fumed and steeped wares by its smooth polish produced by burnishing or steeping in a fat clay slip, which gives the under surface a satin-like gloss, and by conformity to the well-defined repertory of Belgic forms. Though the strictly Belgic technique went out of fashion before the Flavian period, A.D. 69, its recurrence in the first half of the IV. century is proved by examples found at Cologne in forms belonging to the Constantine period. (Loeschcke, *Sammlung Niessen*, plates III.–IV.) Similar late examples are also to be seen in the Provincial Museum at Trier. Colchester and Reading Museums (Silchester Collection) are depositories of a few specimens of true Belgic terra nigra found in Britain, and a saucer with the potter's stamp from Camelon is in the Museum of Scottish National Antiquities, Edinburgh.

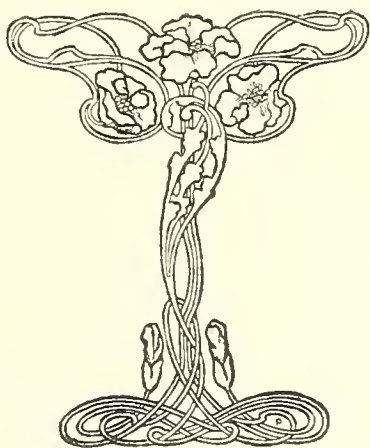
The Upchurch ware so well represented in the Museum at Rochester, nearest to the marshes where found, presents a limited but definite and distinct range of forms evidently derived from the Belgic and identical with the later Romano-Belgic of the latter half of the I. and early II. centuries, which is evidenced by their various freakish La Tène features, such as the sharp-angled bulge, narrow waist, constrictions, concavities, gouged incisions, cordons, &c. It differs from fumed wares of the period found beside the kilns in other parts of Britain, as at Silchester, Lexden

near Colchester, Higham, Corbridge, &c., which display a different combination of Late Celtic survivals.*

Rustic † linear ornamentation of Late Celtic origin is common to all kinds of coarse pottery of Roman date and is not peculiar to any type, period or locality. Form, proportions and technique are all that remains to indicate their provenance and chronology. Owing to the longevity of many of the types, which survive in closely similar form and technique for lengthened periods, even centuries, it will add considerably to the archæological value of such wares should the proportions stated in the accompanying Tables of Standard Proportions prove reliable as indications of date.

* It is customary to call all kinds of 'fumed' grey to black wares "Upchurch ware," but evidently they were not all made in one spot or all imported.

† By some writers the term 'rustic ware' is applied exclusively to the small fumed ollæ decorated *en barbotine* with zones of rough ridges, described in the preceding Part III., p. 27, plates XIV. *a* and *b*, 4. They forget that all coarse local wares and decorative designs upon them are more or less rustic in character, and are properly so designated by German writers.



DESCRIPTION OF THE PLATES.

The illustrated examples are arranged on the plates in the following order:—

2.—PLAIN CLAY BODIED VESSELS.

(a) WHITE CLAY VESSELS OF FINE TEXTURE.

(Clay-colours never occur in quite pure or uniform shades, so that 'white' includes creamy white, light brown and other pale clays, in contrast to natural reds and fumed grey to black wares of various shades. The aim seems to have been, in many instances, to make the vessels appear white by dipping them in white slip before baking.)

Plate XVI.

1. Egg-shell ware Cup.
 2. Neck and handle of Ewer (oinochœ) in imitation of bronze.
 3. Side-fragment of Cantharus.
-

Plate XVII.

- 4—5. Two-handled Lagenæ.
 - 6—9. One-handled Flask and Flagons.
-

Plate XVIII.

- 10—11. Honey-pots.
-

Plate XIX.

12. Tureen (fragment).
 13. Roulette notched Bowl.
 14. Upright sided Mortarium.
 15. Mortarium covered inside with quartz.
 16. Unguent Pot.
-

(b) PLAIN CLAY-BODIED VESSELS OF COARSE TEXTURE.*Plate XX.*

1. Cantharus or two-handled Wine-cup.
 2. Cantharus or crater (mixing vessel).
 3. Small Flask.
 4. Handled-pitcher with spout.
 - 5—6. Narrow-necked Ollæ with handles.
-

Plate XXI. a, b, c.

- 7—8. Handled and narrow-necked Ollæ.
- 9—13. Ollæ.

Plate XXII.

- 14. Beaker.
- 15. Barrillet.
- 16. Pedestalled Cup.
- 17. Bell-mouthed Cup.
- 18. Carinated Bowl.
- 19. Porringer with flat rim.
- 20. Cheese-squeeze.

Plate XXIII.

- 21—22.—Triple-vases.
- 23—26. Feeding-bottles.

Plate XXIV.

- 27—29. Mortaria and potters' stamps thereon.

Plate XVI.

- 1. SMALL OVOID, OLLA-SHAPED CUP, with flat everted rim, and slightly out-curved foot.

White clay with traces of a darker colour-coating in the protected angles.

Thickness about $\frac{1}{20}$ in., height $2\frac{3}{8}$ ins., dia. of rim 2 ins., bulge $2\frac{3}{4}$ ins., base $1\frac{1}{16}$ in.

Width proportions, 86 : 117 : 43 ; margins, 50 : 56.

This must, in Roman times, have been regarded as a *chef d'œuvre*, too fragile to be put to everyday use, and appears analogous to the small china ornaments commonly sold as souvenirs at the present day.

Two *amphoræ* stored in the temple of Erythrea *propter tenuitatem* are mentioned by Pliny, Nat. Hist. XXXV., 46.

A fragment of a vase of equal thinness is in Mr. T. Arthur Acton's collection of pottery from the excavations in progress at Holt (BOVIVM), 9 miles south of Chester.

A vessel of like form and size, 2 mm. thick, in black polished *terra nigra*, so smooth in finish as to resemble turned bronze, is illustrated by Kœnen, p. 72, IX., 14, and ascribed to the middle third of the I. Century. Another example of still greater tenuity, hardly exceeding that of an egg-shell, also in polished *terra nigra*, but of the form Kœnen, IX., 13, having an acute-angled projecting side, is more fully described by Déchelette among those derived from the I. Century Gallo-Roman necropolis of Roanne. *Bulletin de la Diana*, tome XIII, 1902, p. 46. He says : "the potter seemed desirous to rival nature in forming real egg-shells." On the under base it bears the stamp of the potter OFMATE, whose stamp has also been found at Chester, Wilderspool and Neuss (A.D. 25–105.)

2. NECK AND HANDLE OF EWER (*oinochœ*) in imitation of bronze.

This fragment is skilfully imitated from a bronze prototype in hard white terra cotta tinted superficially to a delicate shade of light brown. The neck expands gracefully upwards to a trumpet shaped mouth, bordered by a sharp edged upright rim to which the handle is connected by the heads of two long-beaked water-birds partly encircling it. The outlines of the heads are incised and the eyes painted in dull red. A spirula is incised at the base of each bird's neck. The apex of the handle has a thumb-knob, and down the outside are rude reliefs representing a human face, crescent and other ornaments. The lower end no doubt had a human face or figure in the usual way, but this like the rest of the body is broken away. Just below the lip are five sharply incised girth-grooves, and two others lower down the neck.

Two similar handles are figured and described by Déchelette, II., p. 316, plate VIII., 1, 2, in clay and technique identical with the white figurines found by him on the site of the potteries at Vichy, and he concludes that the ewers were made while the potteries were at work there during the I. and II. Centuries.

An example of the bronze prototype, showing the shape of the vessel when complete, which was recovered from an early pit LVII., at Newstead, is represented on plate LVI. and described on p. 275 of Mr. James Curle's recently published volume, and indicates the end of the I. Century as the probable date of both bronze prototype and terra cotta imitation.

3. SIDE FRAGMENT OF A LARGE TWO-HANDLED VASE.

Fine creamy-white clay well polished externally.

Corniced rim composed of an ovolo moulding and row of dentils. The upper half of the body is nearly upright, widening gradually downwards; the lower half slightly bulged. There are marks on the rim moulding made by the outside edge of the roulette used to form the dentils. Mouth dia. $7\frac{7}{16}$ ins.

The moulded rim and upright handles indicate this to be a late and exaggerated form of the Cantharus sacred to Bacchus. Cf. Plate XX., Nos. 1 and 2.

Plate XVII.

4. TWO-HANDLED PITCHER (*lagena*), Type 52 Lœschcke.

Hard smooth pipe-clay, externally polished.

Body globular, with two shallow girth-grooves at the lower attachment of the handles, which are two-ribbed and semicircularly bent. Short neck, expanding to a slightly thickened lip without moulding, but defined by two incised grooves. Base beaded, ringed, and carefully turned off beneath.

Height $7\frac{1}{4}$ ins., diam. of bulge 7 in., base $2\frac{3}{4}$ in., height of neck $1\frac{13}{16}$ in.

Proportions, 25 : 97 : 38.

It resembles one found at Weisbaden, ORL XXXI., plate XIII. 14 (A.D. 83—123) and, being of somewhat slighter proportions, probably dates from about A.D. 150.

5. AMPHORA, form Bohn 85, Kœnen XV. 18.

Drab smooth pipe-clay.

Body roughly ovoid (drooped) and distorted, with marks all over of careless throwing. Underbase domed inwards and grooved. Handles of roughly square section (ill-formed) and joined at the lower attachments by a shallow double girth-groove. Thin-edged lip.

Height $8\frac{3}{4}$ ins., dia. of bulge $5\frac{3}{8}$ ins., base $2\frac{1}{2}$ ins.

Proportions, 20 : 61 : 28.

Kœnen, p. 98, XV. 18, represents this as one of the commonest forms in the Antonine and later grave-fields,—(A.D. 140—190) onwards.

Behn, *Röm. Keramik*, form 80, Nos. 775—6, 1753—4,—first half of III. Century.

Lehner, *Novesium*, p. 316, XX., 7, circa 200 A.D. and 18—19, second half of III Century.

The form is therefore characteristic of the late Roman period, from the end of the II. to the beginning of the V. Century.

6. ONE-HANDLED FLASK.

Long straight neck with double-moulded funnel shaped mouth-piece, and two shallow grooves at the upper joining of the handle. Pear-shaped body with beaded foot and hollow turned base. Flat three ribbed handle, bent at a right angle, joining the middle of the neck and shoulder.

Hard, smooth, light brown clay.

Height $9\frac{3}{4}$ ins., neck 4 ins., dia. of body $5\frac{1}{4}$ ins., base $2\frac{1}{2}$ ins.

The form is well profiled and proportioned, and often met with in the glass flasks ornamented with serpentine threads of the early III. Century. Cf. Kisa, *Die Antiken Gläser*, zu Köln, plate VI., 56, 60; XXVIII., 226, 227. Hettner, *Führer durch Prov. Mus. in Trier*, p. 109, No. 10.

WHITE FLAGONS.

Synonyms : jug, pitcher, water-bottle, flask ; German, *krug* ; French, *flacon*, *cruche*, *ampoule* ; Latin, *lagena*, *ampulla* ; Greek, *λαγηνος*.

As the nearest to the Latin original *lagena*,* if not directly derived therefrom, the name of flagon is here preferred to any otherwise

* LAGENA is employed by Walters for a long-necked, one-handled flask of *terra sigillata*, Cat. p. 74, M 131. Instances of two-handled pitchers inscribed with their Latin name LAGONA and LAGVNA are cited by Curle, *Newstead*, p. 267. The old English name of flagon has also been revived recently in connection with Colonial wines sold in similar big-bellied bottles.

appropriated synonym for the round-bodied narrow-necked vessels of ordinary clay with one or two handles so abundant on Roman sites.

That the one-handled flagon has come to be regarded as "the leading chronological indicator in the early grave-fields," and as "speaking with a certain voice in regard to the period of a discovery" is owing to its wide distribution throughout the period of the Empire, and its marked and peculiarly Roman characteristics, which can be readily recognised. Even in the Christian period when it ceased to be carefully deposited in earth along with the cinerary urn, it was only superseded by two or three similar vessels of smaller size, less than 6 inches high, and of one third or one quarter the content of their predecessor, placed in the corners of the coffin or sarcophagus where there was no room for the larger one, and probably used symbolically or according to custom.

In domestic use it survives to the end of the Roman period and occasionally in Frankish or Saxon graves.

It is noted by Lœschcke, *Haltern* V., p. 111, and Ritterling, *Hofheim*, plate VI., types 24, 26, that as early as the beginning of the I. Century, when ordinary brick-red clay was used for flagons, it was not seldom coated with white clay slip—usually nearly all worn away,—a peculiarity often observed on flagons derived from Romano-British sites, and the preference for white, creamy, light buff, or very pale clay for flagons appears to have been universal.

The colour of mortaria or pelves seems to have been influenced by a similar convention, the majority being of pale clay, and, when of red clay, often coated with or retaining traces of white slip.*

*This conformity of colour suggests that the mortarium and lagena may have been used in conjunction as basin and ewer for ordinary ablutions by the Romans, who were a cleanly people. In this connection Ward's suggestion (*The Roman Era in Britain*, p. 173, Fig. 51) may be cited, that the mortar was not ordinarily used resting on a table, but was inserted in a round hole large enough to receive the body, yet allow the rim to rest on its edge, confirmed by the more careful finish on the inside and rim of the vessel and often rough condition of the exterior. Taken together these peculiarities are consistent with the use of an article of furniture like the old fashioned wash-hand stand, and the hard coating inside the mortarium may have served to resist the constant friction of the heavy upper vessel or for hand-rubbing. Fine sand may also have been used in lieu of soap and, in order to retain it, the dirty water slowly poured off by means of the spout. It may likewise be mentioned that white pipe-clay is absorbent and only suitable for holding water.

One of the chief centres of manufacture of white clay flagons was Cologne, or Andernach on the Rhine, near both of which white clay is abundant. In the museum of Boulogne, also a great manufacturing centre, are examples of similar form to those found in the early fort at Newstead (plate XLIX., B2 and 4, fig. 33, 6.) Many were imported from Italy along with the legions. In short their manufacture was carried on in all parts wherever suitable clay could be obtained. Hence the name "Salopian ware," when applied to white clay wares of the Roman period, is misleading.

The following is a list of the principal authorities who furnish material for comparative study of white flagons of various periods and localities :—

AUGUSTAN PERIOD (B.C. 30—A.D. 14). *Mitteil. der Altertums-Kommission für Westfalen, heft I., Abb. 18*; *Ibid.* Loeschcke, *Haltern* V., plate XII.

CLAUDIAN PERIOD (A.D. 41—54). *Annal. des Vereins für Nassauische Altertumskunde*, XXXIV., 1904, pp. 86-87, Ritterling, *Das früh römische Lager bei Hofheim* (A.D. 40—60) *Abb. 39—40*, plate VI.

FLAVIAN PERIOD (A.D. 69—96), *ORL XVI., 25a Okarben*, plate V., Nos. 62, 63, 68; Curle, *Newstead*, p. 263, Fig. 34, plate XLVI. 33.

HADRIANIC PERIOD (A.D. 117—138), *ORL XIII., No. 25 Heldenbergen*, plate III., Nos. 2, 6, 43, 45.

ANTONINE PERIOD (A.D. 138—192), *Mitteil. über römische Funde in Heddernheim* IV. 1. Das römische Gräberfeld bei Praunheim, Prof. Dr. A. Riese. 2. Römische Villa in Praunheim nebst dem an sie angrenzenden Teile des Gräberfeldes, Prof. Dr. G. Wolff. 5. Die Fundstücke aus der römischen Töpferei vor dem Nordtore, Direct.-Asst. R. Welcker.

1. Gräberfeldt, A.D. 90—150, plates I.—X.

2. Villa „ 117—200 „ XI., XII., XX.

Gräberfeldt „ 50—117

5. Töpferei „ 133—200 „ XVI., XVIII., XX.,

Abb. 18—20.

Curle, *Newstead*, p. 263, fig 34, A.D. 140—180.

TO MIDDLE OF III. CENTURY, Duncker, *Rückingen*, plate III., Nos. 14, 17, 18.

GENERAL. Kœnen, p. 81, 98, plates XI., 25, 26; XV., 15, Poppelreuter and Hagen, *Bonn. Jahrb.* 114/5, 1906, p. 349, plates XXI.—XXVI.; F. Behn, *Römische Keramik*.

EARLY PERIOD, A.D. 0—69.

The early flagons imported with the legions or shortly before or after their arrival, or made under their direct supervision, as at Xanten,* Neuss,† &c., are distinguishable by their severe and serviceable shapes. Their chief characteristic, stability, is secured by their inclination to width, the position of the widest part of the holder near to or below the middle of the height; but mainly by the width of base and provision of a foot-ring. Their long nearly cylindrical necks expand slightly upwards to a funnel-shaped opening, to assist filling, and the mouth-piece is strongly moulded and separated from the neck by a wide off-set. The junction of the neck to the globular, ovate, ovoid, or pear-shaped body is angular, and not curved or bevelled. The handle projects directly from the neck at some distance below the mouth-piece, and bending at an angle in harmony with the line of the neck, descends vertically to the middle of the shoulder or is somewhat extended. On the outside it is divided into four ribs by three vertical grooves.

As stated in the Table of Standard Proportions Nos. VI.—VII., the base proportion of the white flagons derived from Haltern, Trier, Cologne, Colchester, &c., during first half of I. Century, usually exceeds 40 per cent. of their height; the body proportion exceeds 80 per cent. or more than $\frac{4}{5}$ ths; and the height of the body, as found by deducting the neck proportion in column 1 from 100, is invariably less than its width throughout the I. Century.

In Tables Nos. VI.—VII., relating to white flagons the percentage proportion of the height of the neck to the total height is inserted in column 1 in lieu of that of the rim, which is too small to be of any chronological or typological significance. When no angle or other indication exists to show where the body leaves off and the neck begins a plumb-line measurement from the top edge of the lip to the shoulder is taken, as the nearest possible approximation to the height of neck, for determining the neck proportions in column 1.

FLAVIAN-HADRIANIC PERIOD, A.D. 69—138.

Already at the close of the Flavian epoch there are marks of decadence,‡ and by the end of the I. Century the neck has grown

* Loeschcke, *Haltern* V., p. 118 f.

† Lehner, *Novesium*, p. 419.

‡ Poppelreuter, *Bonn. Jahrb.* 114/5 (1906), p. 350; Kœnen, p. 70, XV., 15.

shorter and more conical, its width increasing downwards instead of upwards. The mouldings on the mouthpiece have become less bold, and the number of rings of the 'screw' are reduced to four or three, in lieu of five or six as formerly. The handle is correspondingly shortened and perforce attached nearer to the mouth-piece, whence it curves to an extent that brings it near to the lower part of the neck (which has already begun to curve gradually outwards at its junction with the body); and the number of ribs on the handle are two or three only, divided by one or two vertical grooves. The width proportions of the body or holder have dwindled to less than 80 and 30 per cent. for bulge and base respectively, as shown in columns 2 and 3 of Table VI. for flagons of the late Flavian-Hadrianic period, derived from Newstead, York, Wiesbaden, Heddernheim (graves), Cologne, &c.

A new type of flagon with elongated body (Kœnen, XV., 15, *Novæsiwm* XXVII., 11), had already appeared by the middle of the I. Century, yet the white flagons generally retained much of their early excellence down to the Hadrianic period (A.D. 117—138).

ANTONINE PERIOD, A.D. 138—192.

During the Antonine period (A.D. 138—192) and down to the end of the II. and beginning of the III. Centuries, as illustrated by the discoveries at Newstead,* Heddernheim (potteries),† *NOVAESIVM*,‡ Corbridge, &c., the white flagons lose their severity of outline, and to a great extent their serviceable proportions, and become rounded and featureless in all their parts, owing to intensive and careless production in late provincial potteries. The neck becomes still shorter and has a curved profile, and the handle is bent in a semi-circle to match; the side walls of the neck are generally thicker than those of the body, which may account for neck and handle being so often preserved. On the outside no angle appears where neck and body unite, the high shoulder curving suddenly to meet the curve of the neck. The mouth-piece has become a mere thickening and outbending of the neck, with one or two weak mouldings on the outside and a slight groove or offset defining it. The handle is attached to the neck just

* Curle, *Newstead*, Fig. 33, Nos. 8—14.

† Welcker, *Hedd. Mitteil.* IV., p. 132 ff, plate 21, Nos. 27—31.

‡ *NOVAESIVM*, pp. 315, 317, plate XX., 5, 9, p. 361, XXVII., 60,

below, and bends sharply upwards and in a semi-circle outwards to the high shoulder. The lower half of the body curves inwards to a cut-off base without moulding or foot-ring.

POST-ANTONINE PERIOD, A.D. 192—250.

Before the middle of the III. Century, when they begin to be displaced in the inhumation, or Christian graves, by little jug-like flagons with spouts, less than six inches high, the tall white flagons, like the bulbous goblets referred to in Table III., part 3, have become elongated to an inordinate degree. The mouth-piece is reduced to a flat ring, or to an outcurved continuation of the neck without any off-set, but only a shallow groove defining it. The round-bent, two-ribbed handle is no longer attached to the neck, on which there is no room, but to the under-side of the lip. The lower half of the body is markedly concave or tapers rapidly to a small-ended stump, too narrow for elegance or stability, so that the vessel appears top-heavy.

The body proportions as shown in Table VI. have diminished 20 per cent., equal to a decrease in the diameters of bulge and base of one quarter and one half respectively, in the course of two-and-a-half centuries.

LATE PERIOD, A.D. 250—400.

The rarity of the larger type of flagons during the later period appears as much due to the preferential use of glass, sigillata-ware decorated with white paint or en barbotine, colour-coated and other 'fancy wares' for domestic purposes, as to the discontinuance of their deposit in the graves.

Small flagons, less than 6 inches in height and one third or one quarter the content of the ordinary ones already described, made their appearance quite as early and underwent the same gradual deterioration as the others, and when they begin to prevail in the middle of the III. Century, they display the rough workmanship, coarse material, and other deficiencies of their contemporaries. The body has markedly concave or unduly contracted upper and under profiles and ends in a small cut-off base. The lip is mostly plain, and, to provide a spout, is bent down slightly on the side opposite to or at right angles to the handle. They are thick sided and of hard pasty clay of a light shade,—dirty white, pale buff and drab or Portland cement colour predominating.

Compared with those of the earlier ones of about equal height,* their proportions as shown on Table VII. display a corresponding diminution, and equally serve to indicate their approximate date, during the four centuries of their survival.

7. ONE-HANDLED, LONG-NECKED FLAGON.

Hard, smooth, pipe-clay.

Body globose above; somewhat conical below the middle. Two-ribbed handle joining the lower mouldings of the mouth-piece to the middle of the shoulder by a nearly quarter-round bend. Mouth funnel shaped with projecting lip and four bead mouldings below. Beaded and ringed foot, with turned-off under base.

Height $9\frac{1}{4}$ ins., neck $3\frac{1}{2}$ ins., ; diams. of bulge $6\frac{1}{8}$ ins., base $2\frac{3}{8}$ ins.

Proportions, neck 37, body 66 : 25. Find-spot, Clifton, 1887,

Allowing for the unusual length of neck the proportions are those of vessels of the end of the I. Century. (See Table VI.)

The mouth-piece is of the so-called screw-shaped type (*schraubenartig*), but has more resemblance to the lower part of a peg-top. It is commoner, with four to six rings or beads, in this country than on the Continent during the second half of the I. Century. The number and roundness of the mouldings decreases at a later date. Four-ringed examples are recorded by Ritterling, *Hofheim*, p. 87, Abb. 40, 7 (A.D. 40—60) and by Curle, *Newstead*, Fig. 33 (A.D. 69—96).

The great length of mouth-piece and neck masks the true proportions of this vessel.

8. SMALL ONE-HANDLED FLAGON.

Pipe-clay paste polished.

Body pear-shaped, curving upwards continuously to a funnel-shaped mouth without moulding. Handle flat two-ribbed, curving in a semi-circle to descend almost vertically to the steep shoulder. Base flat.

Height $5\frac{1}{8}$ ins., diams. of bulge $3\frac{3}{4}$ ins., base $1\frac{7}{8}$ in.

Proportions, 34 : 74 : 37. Find-spot, Lincoln Castle (New County History).

Severe shape approximating to the late I. Century type, Kœnen XI., 27.

Cf. Poppelreuter and Hagen, *Bonn. Jahrb.*, 114-5, p. 383, plate XXI., graves 6c, 8d.

* As the width proportions vary inversely as the height, those of the smaller are naturally greater than those of the larger vessels.

9. SMALL ONE-HANDLED FLAGON.

Hard, smooth pale paste.

Body oblate spheroidal, curving upwards to a short neck and plain lip, and downwards to a well caved-in slightly everted foot and cut-off base. Two-ribbed strongly curved handle. Lip slightly down-bent to form a spout at right angles to the handle.

Height $4\frac{9}{16}$ ins., neck $1\frac{3}{16}$ in.; diams. of bulge $3\frac{3}{4}$ ins., base $1\frac{9}{16}$ in.

Proportions, 25 : 83 : 34.

This widely distributed type begins to come into prominence in the early Christian graves, when inhumation begins to supersede incineration, about the middle of the III. Century, and continues sometimes to appear in the Frankish and Saxon graves. Kœnen, p. 98, XV., 20; Behn, *Römische Keramik*, Nos. 1745-6, form 41.

In the extensive grave-field at Cologne, illustrated and described by Poppelreuter and Hagen (*Bonn. Jahrb.*, 114-5, p. 418, plate XXV., grave 56*b*, from which so many citations have been made), the earliest example found was accompanied by a coin of Postumus (A.D. 258—267). Flagons of the same type appeared in most of the later graves.

The second part of the following Table of Standard Proportions, VII., contains particulars of these smaller flagons compiled to assist in identifying other examples found in this country and in determining their date.



TABLE OF STANDARD PROPORTIONS.—VI.

WHITE FLAGONS, Normal Size and Tall.

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.		
					<i>Neck.</i>	<i>Bulge.</i>	<i>Base.</i>
B.C. A.D. 11 — 9	Haltern	Westfalen. Mitteil. XII., type 45	White, Tall	INS. 13 $\frac{1}{8}$	23	86	28
„ A.D. 37—41	„	„ type 47	„	9 $\frac{3}{4}$	22	78	31
	Andernach	Bonn. Jahrb. 86 VII., 21—28			26	95	44
0—50	Trier	Prov. Museum, Dr. E. Krüger, 08·214 ^b		7 $\frac{1}{8}$	32	95	46
„	„	08·508 ^a		7 $\frac{7}{8}$	27	90	37
41—54	Remagen	Bonn. Jahrb., 119, XXVI., 1			27	80	36
0—50	Colchester	Joslin Collection, Grave 8, 37	Belgic red	7 $\frac{3}{4}$	22	84	37
„	Cologne, Graves	Bonn. Jahrb., 114-5 p. 380, XXI., 2 ^b	White	6 $\frac{11}{16}$	24	70	40
„	„	p. 381 „ 3 ^c	„	7	23	79	44
„	„	p. 385 „ 8 ^c	„	7 $\frac{1}{2}$	23	72	37
„	„	XXI., 2—11	Average of ten		28	76	35
50—100	Trier	Prov. Museum, Dr. E. Krüger, 08·502		7 $\frac{5}{8}$	30	82	34
40—60	Hofheim	Nassau. Annal. VI., 24	Tall	16 $\frac{1}{2}$	23	63	23
„	„	„ 25		9	29	70	31
50—117	Nida, Graves	Heddern. Mitteil. IV. XII., 1			27	82	36
50—60	Colchester	Joslin Collection Grave 124, 1103	Red	10	32	78	31
50—70	Cologne, Graves	Bonn. Jahrb., 114-5 XXII., 16—19	Average of six		27	70	25
80—100	Newstead	XLVI., type 33		10 $\frac{1}{4}$	28	68	28
	York	Mus. Cat. Plate XVII.		9 $\frac{1}{4}$	38	66	25

TABLE OF STANDARD PROPORTIONS.—VI. *Continued.*

WHITE FLAGONS, Normal Size.

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.		
					<i>Neck.</i>	<i>Bulge.</i>	<i>Base.</i>
80—120	Wiesbaden	ORL XXXI., XIII., 22		INS. 9 $\frac{5}{8}$	19	79	32
„	„	23		9 $\frac{3}{8}$	28	75	30
100—150	Colchester	Grave 25, 146	Light red	9 $\frac{1}{4}$	21	79	34
„	Trier	Prov. Museum, Dr. E. Krüger, 04'777 ^b		7	21	76	32
„	„	07'769		8	26	78	29
„	Nida, Graves	Heddern. Mitteil. IV. I., 20		8 $\frac{1}{5}$	29	70	29
„	„	„ 25		8 $\frac{7}{16}$	31	71	31
„	„	„ 27		7 $\frac{1}{16}$	16	85	25
„	„	IX., 6		7	29	69	29
„	„	XII., 4			27	68	27
Circa, 150	Corbridge, Site II	R. H. Forster,	Smallish	6 $\frac{3}{4}$	29	74	31
„	„	—	„	6 $\frac{7}{16}$	27	73	30
100—150	Arnsburg	ORL XVII., VII., 7—10	Average of six		22	80	22
70—150	Cologne, Graves	Bonn. Jahrb., 114-5 XXII., 20—25	Average of four		19	63	22

TABLE OF STANDARD PROPORTIONS.—VI. *Continued.*

WHITE FLAGONS, Normal Size.

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.		
					<i>Neck.</i>	<i>Bulge.</i>	<i>Base.</i>
A.D. 150—200	Colchester	Joslin Collection, Grave 22, 121	Pinkish	INS. $7\frac{3}{4}$	19	80	32
"	"	" 122	Light buff	$7\frac{3}{8}$	20	76	32
133—200	Nida. Graves	Heddern. Mitteil. IV. XXI., 27			21	85	25
"	"	" 28			21	75	27
"	"	" 29			20	80	29
"	"	" 30			19	89	28
"	"	" 31			18	90	23
"	"	p. 133, Fig. 18			21	66	24
"	"	p. 134, Fig. 20			22	68	20
Circa, 200	Novæsivm	Bonn. Jahrb., 111-2 p. 315, XX., 5		$7\frac{1}{4}$	17	63	23
"	Cologne, Graves	Bonn. Jahrb., 114-5 XXIII., 27b—34ac	Average of four		17	60	20
200—250	"	XXIV., 40a	White	$7\frac{1}{8}$	16	66	20
"	"	" 41a	"	$7\frac{1}{2}$	18	67	26
Coin, Sev. Alexander, 222—235	"	" 43a	"	$9\frac{1}{4}$	15	61	22
"	"	" 44a	"	$7\frac{3}{8}$	17	62	20
II. Cent.	Novæsivm	Bonn. Jahrb., 111-2 XX., 9			17	58	22
Circ. 250	Cologne	<i>Ibid.</i> 114-5 XXIV., 52a	"	$7\frac{1}{2}$	16	58	21
II.—III. Cent.	Novæsivm	<i>Ibid.</i> 111-2 XXVII., 60	"	$11\frac{1}{4}$	12	64	21
200—260	Osterburken	Behn. Röm. Keramik Abb. 8, 24			25	74	20
200—250	Cologne	Bonn. Jahrb. 114-5 XXIV., 37—50 XXV., 51—52	Average of ten		16	62	21

TABLE OF STANDARD PROPORTIONS.—VII.

WHITE FLAGONS, Small Size (under 6 inches high).

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.		
					<i>Neck.</i>	<i>Bulge.</i>	<i>Base.</i>
B.C. A.D. 11—9	Haltern	Westfalen. Mitteil. V. plate XII., type 46	White	INS. $5\frac{3}{4}$	24	90	45
„	„	„ type 48	„	$6\frac{1}{4}$	32	87	38
A.D. 0—50	Trier	Prov. Museum, Dr. Krüger, 05'490a		$3\frac{7}{8}$	37	90	46
„	„	08'210b		$5\frac{1}{2}$	26	92	40
B.C. A.D. 30—14	Cologne	Bonn. Jahrb., 114-5, XXI., 6c	„	4	33	73	45
A.D. 0—50	„	„ 8d	„	$4\frac{1}{8}$	36	70	40
50—100	Trier	Prov. Museum, Dr. Krüger, 03'571a		$4\frac{3}{8}$	39	89	42
„	„	04'877c		$5\frac{3}{4}$	29	94	38
„	„	03'585a		$5\frac{7}{8}$	32	88	35
—	Colchester	Joslin Collection, Grave 47. 271,	Light	$5\frac{1}{2}$	27	86	34
—	York	Museum Cat. plate XVII., 8	White	$5\frac{1}{8}$	34	74	37
100—150	Trier	Dr. Krüger, 06'176b		$5\frac{3}{4}$	27	75	34
138—161	Nida, Hedderheim	Hedderm. Mitteil. IV., p. 27, I. 53		$4\frac{1}{4}$	38	79	33
150—200	Trier	Prov. Museum, Dr. E. Krüger, 08'256e		$4\frac{1}{4}$	27	89	38
„	„	08'256d		6	29	85	34
	Carlisle	Museum, R. F $\frac{67}{137}$	Light buff	$4\frac{3}{4}$	32	82	34
Coin, Pius. 138—161	Nida, Praun- heim Graves	Hedderm. Mitteil. p. 27, I., 53		$4\frac{1}{4}$	38	79	33
	York	Museum Cat., plate XVII., 9	White	$4\frac{1}{2}$	25	83	34
	Colchester	Joslin Collection, Grave 22, 123		$5\frac{3}{4}$	22	78	32
150—200							
200—250	Cologne	Bonn. Jahrb. 114-5 XXV., 48b—d		$4\frac{3}{8}$	25	80	32

TABLE OF STANDARD PROPORTIONS.—VII. *Continued.*

WHITE FLAGONS, Small Size (under 6 inches high).

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.		
					<i>Neck.</i>	<i>Bulge.</i>	<i>Base.</i>
B.C. A.D. 250—300	Cologne	Bonn. Jahrb., 114-5 XXV., 52c	White	INS. $5\frac{1}{8}$	35	83	31
"	"	" 53 ^a	"	$4\frac{1}{2}$	33	75	25
"	"	" 54 ^a	"	$4\frac{3}{4}$	28	75	30
Coin, Postumus 258—267	"	" 56 ^d	"	$4\frac{7}{16}$	29	77	28
"	"	" 57 ^b	"	$4\frac{1}{4}$	40	81	31
300—350	Trier	06.597 ^c		$5\frac{1}{2}$	31	64	29
"	"	06.597 ^b		$5\frac{7}{8}$	32	60	26
"	Cologne	Bonn. Jahrb., 114-5 XXV., 61c	Yellow	$4\frac{15}{16}$	35	62	28
"	"	XXVI., 62b	Yellowish	$4\frac{3}{4}$	32	68	28
Coin, Con- stantine I. 306—337	"	" 64 ^b	White	$5\frac{1}{8}$	26	63	17
Coin, Dioclet. 285—305	"	" 68b	"	$4\frac{3}{4}$	35	66	24
"	"	" 72b	"	$4\frac{3}{8}$	22	44	17

Plate XVIII.

10. HONEY POT (urceus or olla), type 62, Lœschcke.

Light-red clay.

Flat square-edged rim, boldly out-bulged body, with shallow girth-grooves, three above and one below, between the attachments of the upright loop handles.

Height $7\frac{5}{8}$ ins., diams. of rim $4\frac{1}{8}$ ins., bulge $7\frac{1}{20}$ ins., base $2\frac{3}{4}$ ins.

Proportions 54 : 92 : 36, which are approximately those of vessels attributed by Schumacher, (*Alter. u. h. Vorzeit*, heft V, band 5, pp. 161—164), to the second half of the I. Cent. (See Table VIII.)

11. HONEY POT (urceus or olla), type 62, Lœschcke.

Form regularly ovoid. Obliquely inclined rim; beaded foot; girth-grooves between the two upright loop handles.

Height $11\frac{1}{2}$ ins., diams. of rim $6\frac{5}{8}$ ins., bulge $9\frac{5}{8}$ ins., base $4\frac{1}{2}$ ins.

Proportions, 57 : 83 : 38.

The proportions are nearly those of vessels attributed by Schumacher, *Op. cit.* to the first half of the I. Century, but the handles are smaller and lower down than usual on vessels of this early period. (See Table VIII.)

Inscriptions incised upon no fewer than ten similar vessels indicating their name, their weight when empty and full, and the nature of their contents, are recorded. Two of the most important are—

(1) VRPVS.

VRCEVS ET MEL P XXVII.

Urceus Pondo VS(emis).

Urceus et Mel P(ondo) xxvii.

Indicating the vessel to be an urceus weighing $5\frac{1}{2}$ Roman *librae* when empty, and 27 when full, and that it contained $21\frac{1}{2}$ *librae* weight of honey.

Behn, *CIL* XIII., III., 1, p. 90, No. 44.

Schumacher, *Alt.-u.-h.-Vorzeit*, band V., heft V., p. 163.

(2) OLLA MEL. (Olla. honey).

Indicating that the name of *olla* was also used for the same kind of vessel containing honey.

Reims *Mus. Cat.* No. 4564; Behn, *Röm Keramik*, p. 221, Nos. 1474—8.

Schumacher, *Alt.-u.-h.-Vorzeit*, band V., heft V., p. 161 f. Plate 29. Nos. 504—511.

505. PIIIS = 1.475 Kg., present weight 1.44 Kg. *CIL* No. 62.

508. PNVIIS = 5.760 Kg., present weight 4.560 Kg.

509. PXII = 4.075 Kg., present weight 3.939 Kg.

CIL XIII., III., p. 86 ff.

Trier Mus. on an Urn, No. 44, p. 100, *Hettner, Führer durch Prov. Mus. in Trier*, p. 100.

VR PV and VRCEVS ET MEL P XXVIII.*

Reims, *Cat. of Mus.*, No. 4564 (See Behn, *Röm. Ker.*, p. 221), OLLA MEL.

1, Mainz, PIIS?; 2, Xanthen, PIIII.; 3, Köln, PIV.; 4, Metz, T PVI; 5, Andernach, XIIS.

At first, by way of ornament, they had only from 1—3 girth-grooves between the handles, but others lower down the side were added subsequently.

The two small upright loop handles are supposed to have served for retaining a sealed fastening band drawn through them and across the coverlid, to exclude flies (and fingers) on transit. On a like example from an early pit, No. LXXVI. (A.D. 80—100) at Newstead, (*Op. cit.* p. 244, plate XLVII.) two small conical cups, with solid pedestals reaching to the shoulder, placed midway between the handles, may have been intended to receive and protect leaden seals on the ends of a metal band crossing the lid in the opposite direction, as an additional security against pilfering during the journey northwards.

Early examples are described by Schumacher as being carefully, artistically, and strongly built, but later ones display the degradation in form, material, and technique, which overtook all the arts and crafts of the Lower Empire.

Eleven such vessels, found in cremation graves, Nos. 2, 8, 22, 23, 25, 26, 68, 71, 76, 124, Joslin Collection at Colchester, (Price, *Colchester Museum Cat.*), have been used as Cinerary Urns. They extend over about three centuries, from Grave-group 124, containing a number of St. Remy green-glazed figurines, dated not later than A.D. 50, by 30 coins from Agrippa to Claudius, down to Group 71, which includes a glass unguentarium, having four indentations on the side of IV. Century type (*Hettner, Führer durch Prov. Mus. in Trier*, p. 107, fig. 20).

*Behn, CIL XIII., III., 1, p. 90, No. 44.

TABLE OF STANDARD PROPORTIONS.—VIII.

HONEY POTS.

Date.	Provenance.	Reference.	Description.	Orna-ments.	Height	HEIGHT 100.		
						Rim.	Bulge.	Base.
A.D. 14—50	Mainz	504 Plate 29.	Fine White	2	CM. 26	42	105	38
14—	Wiesbaden	505 „	Reddish-White, coated	3	23	44	98	35
about 100	Near Mainz	506 „	Grey, black varnished.	2	22·5	51	102	33
100—150	Trier Maar-Paulin	507 „	Grey-yellow, polished	2	24	50	99	34
150—200	Mainz or neighbourhood	508 „	Reddish, coarser	2	34	43	90	30
211—260	Mainz	509 „	White-grey coarse	1	38	40	100	29
III.—IV.	Trier, Pallien	510 „	Creamy-buff	2	27	42	84	28
IV.	Near Engers	511 „	Red-yellow	3	30·5	39	95	27

The dates are those given by Schumacher and the proportions are computed from his dimensions.

50—100	Colchester Museum	Joslin Collection Grave 23, 130	Light-buff		INS. 7 $\frac{5}{8}$	65	92	39
„	„	„ 76, 430	Buff		9 $\frac{3}{4}$	50	93	38
„	„	„ 2, 7	Light-buff		10	51	90	35
100—150	„	„ 8, 32	Buff		11 $\frac{3}{4}$	53	83	32
150—200	„	„ 22, 120	Light-buff		11 $\frac{1}{8}$	46	88	30
200—250	„	„ 71, 405	Light-buff		9 $\frac{1}{4}$	48	81	29

From information supplied by A. G. Wright, Curator.

I. Cent.	York Mus. Cat.	Plate XVIII., 10	Red		7 $\frac{5}{8}$	54	92	36
„	„	„ 11			11 $\frac{1}{2}$	57	83	38

Plate XIX.

12. SIDE FRAGMENT OF A WIDE-MOUTHED, SHALLOW BASIN OR TUREEN, with two upright two-ribbed loop handles. The lower portion and base are strongly outbulged (foot wanting).

Hard pipe-clay paste, smooth polished externally. Greatest diam. $8\frac{1}{2}$ ins.

The form is an unusual one, for which no parallel has been traced.

13. SIDE FRAGMENT OF BOWL, in imitation of the terra sigillata bowl, form 37, Drag. (drawing restored), one of several such fragments.

Fine hard light-red terra cotta with matt surface.

Beaded lip, round the body a sunk band $\frac{7}{8}$ in. wide, 3 in. wide zone of roulette hatching, bordered below by two girth-grooves. Plain well turned foot-ring, slightly outset. Height $3\frac{3}{4}$ ins., original diam. of rim $7\frac{5}{8}$ ins.

Walters, Cat. M2729, Fig. 277, included among II.-III. Century wares.

Curle, *Newstead*. p. 257, XLVII., type 44, A.D. 140—180.

The type is also met with in the *castella* of the German limes, No. 8, *Zugmantel*, plate XVIII., 13, A.D. 117—249, and in those of the *Limes Rhaetiæ*, No. 66a, *Urspring.*, V. 47, AD. 90—160; No. 66c *Faimingen*, XII., 12, A.D. 100—240; and No. 73, *Pfünz*, VII., 11—13, A.D. 98—233. These are probably local imitations of a late terra sigillata bowl of poor paste similarly ornamented.

14. RIM FRAGMENT OF WIDE SHALLOW BOWL, with nearly upright collar, in shape resembling a mortarium, but with no stone particles visible on the interior.

Hard light-buff clay (stone colour?) Including a slightly projecting rim on the inside edge, the collar is $1\frac{1}{2}$ in. wide and about $\frac{1}{2}$ in. thick, and has incised grooves round the outside edges. A depression $\frac{3}{4}$ in. wide and $\frac{1}{4}$ in. deep is cut across for a spout, which has lips like a double door wide open on either side.

The name of the potter MARTINVS is stamped vertically on both sides of the spout. Diam. at top of collar $8\frac{7}{8}$ ins.

The Colchester Museum contains two bowls of similar shape, not studded with stone particles on the inside, and a quantity of fragments of others found in the kilns at Lexden Road, near Colchester, one of which fragments is stamped with the name of the potter MARTINVS. These are said to be principally of local make, and the potter named probably worked in this locality. J. E. Price, *Cat. of Anglo-Roman Antiquities in Joslin Collection*, p. 62, No. 829.

15. MORTARIUM OR PELVIS.

Hard creamy-white paste.

Roll-rim bulged boldly on the inside and down-bent almost vertically on the outside of the vessel. Below the rim are several ribs made in turning. The whole upper surface of the rim, as well as of the interior, is coated with transparent quartz particles well polished by wear.

Height $2\frac{7}{8}$ ins. Diams. of rim $9\frac{1}{4}$ ins., base $3\frac{1}{8}$ ins.

The date of this example, as indicated by the form of rim, is about A.D. 150—200.

A mortarium similarly coated on the rim as well as the interior with stone particles, was recovered from one of the early pits, X. (A.D. 69—96 or a little later), at Newstead, *Op. cit.* p. 263, type 24.

16. UNGUENT POT, type 61, Lœschcke.

Hard greyish-white pipe-clay.

Diminutive pear-shaped body perched on a high slightly expanded foot and overtopped by a wide mouthpiece bordered round the outside edge by a V-shaped groove.

Height $3\frac{1}{2}$ ins. Diams. of rim $1\frac{7}{8}$ in., body 2 ins., base 1 in.

One of several examples of the commonest type of by-gifts in the cremation graves of the first three centuries A.D.

With reference to an early example found at Haltern (B.C. 11—A.D. 9), Lœschcke states that the form remains the same or nearly so for centuries. Haltern V., p. 245, type 61.

Another found at Neuss is ascribed by Lehner to the period A.D. 69—105, *Bonn, Jahrb.*, 111/2, p. 356, plate XXVII., 16. Of about the same period is that recorded by Curle, *Newstead*, plate XLVI., type 27.

Six such little clay pots with plain rims were found together with a coin of Faustina the elder, A.D. 138—141, in the fort No. 8, Zugmantel, on the German limes. ORL XXXII., p. 171, plate XVII., 23, 25.

In the last two mentioned instances the body has a spiral groove from top to bottom produced in turning.

C. R. Smith's *Cat. of London Antiquities*, p. 19, No. 69.

(b) PLAIN CLAY-BODIED VESSELS OF COARSE TEXTURE.

Plate XX.

1. TWO-HANDLED PEDESTALLED CUP (*cantharus*), form 53, Drag.
Common soft brick-red clay (unglazed).

Vertical handles, with horn-shaped thumb-rests at the upper and plain rings at the lower attachments, connect the trumpet-shaped mouth and globular body. The pedestal has a straight stem equally divided by a collar moulding, and a bell-mouthed foot with beaded margin.

Height $7\frac{1}{4}$ ins., diams. of body $3\frac{1}{2}$ ins., inside of rim $2\frac{7}{8}$ ins.

This crude imitation of a popular Italian model gives no indication of date. A similar example in the Trier Provincial Museum, 05.142 was found with other vessels in a grave dated by Dr. Krüger A.D. 300—350. It resembles in shape the sacred vessels represented on monuments of Mithras worship, and the horns may be rough indications of the heads of serpents on the handles of such vessels. Cf. Schumacher, *Alt.-u.-h.-Vorzeit*, V., heft IX., plate 52, 964; Behn, *Römische Keramik*, 1218, form 396;—these being moss-green enamel glazed vessels with figured ornamentation *en barbotine*, of II. Century type.

It is constantly associated, on the monuments, with the wine-god Dionysos (Bacchus) as one of his attributes.

2. WIDE-MOUTHED TWO-HANDLED MIXING BOWL, or “loving cup,” form 352, Behn.

Soft unglazed brick-red clay.

Vertical out-bent handles joining a double-moulded rim and slightly out-bulged lower portion, which is divided from the nearly cylindrical upper half by an offset.

Height $6\frac{3}{4}$ ins., diams. of rim $5\frac{5}{8}$ ins., bulge $5\frac{3}{4}$ ins., base $2\frac{1}{16}$ ins.

A vessel of similar form with poor red sigillata-like glaze found at Dunapentele in Hungary is attributed to the III.—IV. Century by Behn, *Römische Keramik*, No. 1239, form 352.

Köenen, p. 99, XV., 27, states that the form was common in the Antonine period (A.D. 140—190) and probably employed in the worship of Mithras. It is therefore a late and degenerate form of the Cantharus.

3. SHORT-NECKED FLASK WITH HANDLE.

Light pinkish-red soft clay.

Wide flat square-edged rim, nearly cylindrical body with rounded angles.

Height 6 ins., neck $1\frac{1}{4}$ in.; diams. of body $3\frac{5}{16}$ ins.— $2\frac{1}{16}$ ins.

The form is more frequently found in glass. Cf. Hettner, *Führer durch Trier Prov. Mus.*, p. 109, No. 30.

4. NECK AND PART OF HANDLE OF PITCHER, with pinched-in rim to form a narrow projecting spout with triangular profile. Neck cylindrical with three girth-grooves. Handle sharply bent, rising above the rim to descend vertically to the shoulder.
5. LARGE NARROW-NECKED OLLA, with two eye-lets partly counter-sunk into the shoulder, intended for a cord or wire hooks ($\frac{5}{8}$ in. opening).

Coarse, hard, dark-grey to black fumed clay.

Outcurved rim, elliptical body, underbase domed inwards. Ornaments: A scored line forming loops on the shoulder, above the eyelets; two zones bordered by girth-grooves round the body, the upper zone scored across by vertical lines in groups of three, and the lower zone by oblique lines at regular intervals.

Height $12\frac{1}{2}$ ins., diam. of rim $5\frac{1}{4}$ ins., bulge $9\frac{1}{2}$ ins., base $4\frac{3}{4}$ ins.

Proportions, 41 : 76 : 38.

The form, eyelets on the shoulder, decoration and technique, are all alike of Late Celtic origin.

6. LARGE TWO-HANDLED NARROW-NECKED OLLA, with wide, flat, square-edged rim, ovoid body and beaded foot.

Soft red-clay, very light in weight.

Height $11\frac{1}{2}$ ins., diams. of body $5\frac{1}{2}$ ins., bulge $8\frac{1}{4}$ ins., base $3\frac{1}{2}$ ins.

Proportions, 41 : 72 : 31.

A parallel is figured in C. R. Smith's *Cat. of Roman Antiquities*, plate V., No. 4, but its proportions do not correspond with the dimensions stated in the text, p. 16, No. 43, describing it.

Plate XXI. a.

7. LARGE OVOID TWO-HANDLED OLLA, ornamented on the shoulder with two frilled cordons, one above and the other between the handles. Beaded foot, thick horizontal rim, rounded above and flat beneath.

Light dirty-grey clay.

Height $11\frac{5}{16}$ ins., diams. of rim $4\frac{7}{8}$ in., bulge $7\frac{3}{4}$ ins., base $4\frac{1}{8}$ ins.

Proportions, 46 : 68 : 36.

The form somewhat resembles that of the so-called honey pots.

Plate XXI. a, b, c.

OLLÆ. The very common fumed-grey to black utensils, which for convenience are termed *ollæ*, since cooking pots, cinerary urns, beakers, and all others of like form are included, have their shape and proportions determined by convenience and necessity and not by convention. They require a wide mouth to receive joints,

birds, and other small animals for stewing; a wide base to rest securely upon a tripod, or iron grid, or uneven surface; a wide rim to allow them to be suspended over an open fire by means of an iron chain with hooks from a triangle, and lifted with a bit of rag on the fingers, in lieu of handles. Hence the attenuation which they, in common with others, have undergone in the course of centuries, is confined of necessity to the bulge.

In the course of centuries the boldly rounded body gradually becomes flatter and the width proportions approximate more to those of a cylinder, until, in the IV. Century, the lip diameter becomes equal to, and at a later date, sometimes exceeds that of the body, while the base diameter undergoes little diminution.

The earliest examples found at Haltern* resemble in shape and proportions the bronze camp-kettle from the early pit LVII. at Newstead.† The rim of the latter is well curved for retaining an iron ring with loops on either side, into which the hooks at the ends of a curved iron handle were inserted, and others have holes in the rim on both sides for the hooks of a similar handle. No trace of an iron ring or handle has been noticed on earthenware examples, but rimless cooking-pots provided with lugs and projections for handling have been found abundantly at Faimingen.‡

Cooking-pots were made of strong, fat clay, mixed with a large proportion of well pounded pottery, calcite, or silica (in the form of sand, quartz, or flint particles), to render them proof against splitting and flaking to which ordinary clayware is liable on exposure to wood flames, or on introduction of hot and cold liquids. Hence the number of such vessels having their clay charged with sand or white particles is very considerable.

RIM SECTIONS OF OLLÆ.

The material for comparative study of the rim profiles of ollæ is obtainable from the authorities quoted with reference to white pitchers, and other writers who will be mentioned in passing. Such profiles are often serviceable for determining the types and dates of vessels.

1.—*Recurved rim.* This nearly semi-circular or C-shaped rim is that of the Roman cooking-pot *par excellence*, which arrived in

* Loeschcke, *Haltern* V., p. 239, XII., 57.

† Curle, *Newstead*, p. 274, plate LII., No. 1. Proportions, 91 : 108 : 51.

‡ ORL XXXV., 66c Faimingen, p. 91, XII., 24, &c.

Northern Europe with the legions from Italy at the beginning of our era, and remained for centuries the base type of the military cooking-pot or olla. Lœschcke, *Haltern* V., p. 239, Abb. 32, 1—8, type 57. It was probably half-a-century later in reaching Britain. Its form was determined by convenience or necessity, and any slight changes it underwent in the course of its development are too minute to be perceptible on a reduced drawing or photograph. Therefore it affords little or no aid in determining dates and is only useful for identifying the type of vessel.

2.—*Inbent rim.* The edge of the boldly rounded, turned-in shoulder, ends in a slight thickening or bead, or is folded over upon itself and grooved on the surface. This form of vessel was taken over by the Romans on their first arrival in Lower Germany from an earlier Belgic or barbaric prototype, and was imitated in their potteries at Xanten in terra nigra technique.

It almost disappeared from Germany, and probably also from Britain in the time of Claudius (A.D. 41—54), but continued in the Danubian provinces down to a later period. Lœschcke, *Haltern* V., p. 240, type 58, Abb. 32, a—c, plate XX., 15, 17, and p. 294, type 91, Abb. 48, 1—5, plate XXV., 1, 10; Drexel, *Faimingen*, p. 90, 3.

The vessel is known as the “Haltern cooking-pot,” and appears to have been widely distributed in the east and south of Britain in the first-half of the I. Century.

It is represented by the bead-rim bowls and ollæ of the I. Century from excavations in Casterley Camp, illustrated in the recent Catalogue of Antiquities in Devizes Museum, E. 35, 36, plate LXV., 3, 4, 6, 10.

The inbent rims of later date are more upright and end in triangular or heart-shaped thickenings.

3.—*Rimless Olla.* The shoulder of the vessel ascends in an ogee curve until upright or ends with a slight outward bend in a plain or beaded lip, without any distinct form of rim.

The vessel is clearly of La Tène type and was made in Belgic terra nigra. It seldom descends lower than the early Domitian period (circa. A.D. 80—90), in the *castella* of the German limes, and is not often found in Britain. One or two fragments from the bottom of an early pit at Caersws have been recognised but not published.

Ritterling, *Hofheim*, VI., 19; Riese, *Hedd. Mitteil.*, IV. (Praunheim graves), pp. 13, 14, plate I., 2, 3, 4; Wolff, *Ibid.* p. 51, 20, 38, 49, 50, 52.

It probably died out, or lost its distinct character about the end of the I. Century.

As its form indicates, it was chiefly used on beakers of bulgy form (swill pots) for holding a large allowance of weak liquor, raised ribs or crescents being placed on their sides to give a hold for the fingers of one hand.

4.—*Oblique rim.* This is small, straight, angularly outbent, and obliquely inclined, thickening upwards or in the middle, with a triangular, long oval, or semi-oval section. It appears in the Augustan period at Haltern, on vessels included among the Belgic types 84, 85, 86, 87, by Lœschcke, *Haltern* V., pp. 280—8, Abb. 44, 1—7.

Vessels of this type are recorded by—Ritterling, *Hofheim*, VI., 20, IX., 1, (A.D. 40—50); Ritterling, *Wiesbaden*, p. 117, XII., 21, 24, (A.D. 83—122); Riese, *Hedd. Mitteil*, IV., p. 14, plate I., 16, 17, 18, 19, from the Praunheim graves, found with coins of Domitian, Trajan, and Hadrian, (A.D. 90—150); Curle, *Newstead*, p. 248, plate XLVII., type 36, from pre-Hadrianic deposits (A.D. 69—96).

In the Rhine and Maine districts it appears before A.D. 100, and in Britain apparently somewhat earlier. The vessels are often decorated with bars, ribs, ridges, leaves, studs, rings, &c., *en barbotine*, and various linear patterns round the body, to give a finger-hold.

The form of lip, surface-coating or polishing, raised ornaments and dimensions, all indicate that they were beakers (drinking mugs), the body being usually ovoid, pear, tub, cask or winepipe shaped.

The absence of all these indications is observable in rare cases when oblique rims are used on large ollæ, such as cooking-pots, cinerary urns, &c. Such rims are to be met with occasionally on Upchurch ollæ (see also plate XXI., 13), and seem to indicate a Late Celtic or La Tène origin.

5.—*Horizontal or level rims.*

(a). *Level lip*, ending an ogee curve on neck and shoulder—a pair of shallow girth-grooves often marking the change from concave to convex on the latter, and two others appearing on the surface of the rim. The flattening of the lip appears in the middle of the I. and dies out about the end of the II. Century, as indicated by the records of its occurrence. (See plate XXI., 9).

Ritterling, *Hofheim*, p. 94, Abb. 50, Nos. 7, 8, 20 (the rim slightly undercut and well moulded); *Wiesbaden*, XV., 12, 21, 26 (A.D. 83—121); Wolff, *Hedd. Mitteil*, IV., XII., 51, 42 (A.D. 50—117);

Barthel, *Zugmantel*, XIX., 2 (A.D. 117—160) and Abb. 30, No. 6 (A.D. 121—138); Dr. E. Krüger, *Prov. Mus. Trier*, 04.777a (A.D. 100—150); Curle, *Newstead*, p. 246, Fig. 25, Nos. 9, 14 (A.D. 69—96).

(b). *Level lip*, ending a convex shoulder (without neck) at an acute angle—like a figure 7 (Arabic numeral) in section. The statistics of provenance show that it belongs to the II. Century.

Wolff, *Hedd. Mitteil.*, IV. (NIDA), XII., 46 (A.D. 50—117); Welcker, *Ibid.*, Fig. 7, Nos. 2, 5, 6 (A.D. 133—200); Barthel, *Zugmantel*, p. 161, Abb. 30, No. 8 (A.D. 161—180). Gibson & Simpson, *Poltross-burn*, V., 9, record a single example (A.D. 270—330).

(c). *Level lip*, becoming beaded or knobbed on the inner, and inclined on the outer edge, in section like a duck's head and neck. This is a later development of (a) and (b) appearing in the second half of the II. Century.

Welcker, *Op. cit.* Fig. 7, Nos. 10, 11 (A.D. 133—200).

6.—*Funnel-shaped rim*, the plain flat rim, obliquely inclined, of the Rhætian pottery, is termed funnel-shaped by Drexel, *Faimingen*, pp. 80, 92, plate XII., 25, 29 (A.D. 100—250).

The form is the prevailing one in Rhætia for red-glazed beakers decorated *en barbotine*, and pots with hollows below the handles for convenient handling, which have not been recorded in Britain, though the funnel-shaped rim has been met with on vessels of Late Celtic type at Corbridge, Colchester, Upchurch (Rochester Mus.), Maidstone, &c. The British and Rhætian examples probably have a common La Tène origin, such as exists between Rhætian and Galatian (Asia Minor) pottery, though there is nothing inherently improbable about direct inter-communication taking place between the two northern provinces during the period of the joint Roman occupation (end of I. to middle of III. Century).

7.—*Cavetto rim*, quarter-round rim rising from a convex shoulder with a sharp bend where the direction of the curve is reversed.

Pitt-Rivers *Excavations*, III., plate 186, 5; Salzmann, *Sussex Arch. Soc. Collections*, Pevensey. p. 14, IV. to V. Century; Cunnington & Goddard, *Devizes Mus. Cat.*, plate XXXIX., 2, 3; XVII., 17, 19; *Guildhall Mus. Cat.*, LIX., 6, 9.

8.—*Flat curved lip*, rising from a sharply curved neck—like a flattened G or a staple-hook in section. The distinct ledge at the joining of neck and shoulder is not a new feature, but appears in a rudimentary form on the early Augustan rims of the cooking-pots at Haltern, V., p. 239, Abb. 32, Nos. 1, 6—8.

Gibson & Simpson, *Poltross-burn*, V., 6, 14, 15 (A.D. 270—330). Examples have also been obtained from the latest deposits (end of IV. Century) at Corbridge.

The two last mentioned types 7, 8 are those which gradually widen until they overhang the sides of the vessel at a late period—IV. to V. Century.

9.—*The sunk-bead lip*, consisting of a shallow groove or ledge, merely defining the rounded edge of the vessel, accompanies the dying out of style and purpose in the manufacture of cooking-pots, drinking-mugs, &c.

By a process of perhaps over-refinement, the types or varieties of rims could be further extended.

8. TALL BOTTLE-NECKED OVOID OLLA, girt at the joining of the neck and in the middle with wide cordons defined by grooves. Flat outbent lip and beaded foot.

Fumed dark-grey clay.

Height 12 ins., diams. of rims $4\frac{1}{2}$ ins., bulge $8\frac{1}{8}$ ins., base $3\frac{3}{4}$ ins.

Proportions, 37 : 69 : 31. Margins, 36 : 39.

Identical in form with those of Belgic terra nigra found with coins of Augustus, Tiberius, and Nero (B.C. 11—A.D. 54). Kœnen, p. 74, X., 4, 5.

Both form and decoration are of Late Celtic origin. Various developed forms of bottle-necked ollæ continued to be employed throughout the Roman period and later. Lœschcke, *Haltern*, V., p. 292, Abb. 46.

9. WIDE-BULGED OLLA, with recurved rim, type 57, Lœschcke.

Fumed light-grey clay, coated with a darker slip on the upper portion of the body.

Proportions, 75 : 108 : 35. Margins, 49 : 61.

An olla of like proportions, 75 : 106 : 35 ; margins, 42 : 61, in Trier Provincial Museum, 03.435, is dated by Dr. E. Krüger, (A.D. 50—100).

10. LARGE, THICK-SET, BOLDLY OUTBULGED OLLA. Rim curving in a semi-circle to a flat-topped thickened lip, beaded foot, and slightly domed under base. (See Rim Section, type 4).

Fumed light-grey sandy clay.

Height $8\frac{1}{8}$ ins., diams. of rim $6\frac{5}{8}$ ins., bulge $8\frac{5}{8}$ ins., base $3\frac{1}{4}$ ins.

Proportions, 81 : 106 : 40. Margins, 27 : 60.

The latter correspond with those in Table IX., dated A.D. 50—100.

11. PEAR-SHAPED BULGY OLLA, with small, straight, obliquely inclined rim, divided from the shoulder by a shallow groove. (See Rim Section, type 3).

Light brick-red coarse clay (unglazed).

Height $5\frac{5}{8}$ ins., diams. of rim 5 ins., bulge $5\frac{5}{8}$ ins., base $2\frac{5}{8}$ ins.

Proportions, 88 : 117 : 46. Margins, 43 : 56.

The form and proportions are those of similar vessels during the second-half of the I. Century.

12. CINERARY URN (containing burnt bones), lightly scored round the body with latticed lines, recurved rim. (See Rim Section, type 1).

Fumed light-grey clay.

Proportions, 70 : 85 : 40. Margins, 20 : 36.

Corresponding with those of middle of the II. Century, in Table IX., and those of a Cinerary Urn discovered in the filling of the ditch of the early camp at Newstead (Curle, *Op. cit.* p. 19, plate IV., 1), belonging to the Antonine period (A.D. 140—180), the directly measured dimensions of which are—Height $9\frac{1}{4}$ ins., diams. of rim 6 ins., bulge $7\frac{3}{4}$ ins., base $3\frac{3}{4}$ ins. Proportions, 65 : 78 : 40. Margins, 16 : 31.

13. TALL OVOID OLLA. Rim straight, obliquely inclined, and thickening upwards to a narrow inside ledge for a lid. Under base slightly domed inwards. (See Rim Section, type 3).

Fumed light-grey sandy clay.

Height $8\frac{11}{16}$ ins., diams. of rim $5\frac{9}{16}$ ins., bulge $6\frac{1}{4}$ ins., base $3\frac{1}{16}$ ins.

Proportions, 64 : 72 : 35. Margins, 11 : 31.

The marginal proportions of an olla can be obtained by placing a set-square vertically against its side, and a straight edge (decimal or metrical scale, or 2 foot rule) across its rim and measuring decimally or metrically—

(a) The vertical distances from the top and bottom to its greatest diameter at the point where the upright touches (near the middle); (b) the horizontal distances from rim and base to the upright.

The percentage proportions of (a) the verticals, to (b) the horizontals (easily worked on a slide-rule), are the marginal proportions required.

In two columns on the right of the tables, a series of what have been termed marginal proportions are inserted as still more useful and striking evidence, based on the gradual flattening of the bulge, for determining the relative dates of ollæ. They are derived from measurements of the varying amounts of inbending from the widest part upwards and downwards on one side only of the vessel, and can be obtained from large fragments which retain any of the widest part, near the middle, and enough of the rim or base for them to stand upright on a level surface.

TABLE OF STANDARD PROPORTIONS.—IX.

OLLÆ (Recurved Rims.)

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.			MARGINS.	
					<i>Rim.</i>	<i>Bulge.</i>	<i>Base.</i>	<i>Rim.</i>	<i>Base.</i>
B.C. A.D. 11—9	Haltern	Westfalen. Mitteil. V. p. 239, XII., 57 ^c		INS. 7 $\frac{7}{16}$	84	95	43	18	39
A.D. 0—50	Cologne, Grave	Bonn. Jahrb., 114-5 p. 381, XXI., 4 ^a	Grey	12 $\frac{5}{8}$	77	106	41	35	48
Coin, Augustus, B.C. A.D. 27—14	„	p. 384 „ 7 ^a	Yellow	8 $\frac{3}{4}$	74	104	37	46	51
	York	Mus. Cat.	Light grey, darker slip, girth grooves	8 $\frac{3}{4}$	80	111	36	46	64
A.D. 40—60	Hofheim	Nassau. Annal., XXXIV., VI., 29		6 $\frac{3}{8}$	79	100	43	28	45
Coin, Nero 54—68	Trier, Grave	Prov. Museum, Dr. E. Krüger, 03'588 ^a		10 $\frac{5}{8}$	86	116	39	39	62
Coin, Vespasian, 69—79	„ „	06'211 ^a	Thick lip, darker slip	7 $\frac{7}{8}$	86	118	46	38	61
50—100	„ „	03'586 ^a	Two girth grooves	8 $\frac{1}{4}$	83	119	45	43	59
„	„ „	03'354	Thick lip, darker slip	7 $\frac{1}{16}$	80	112	44	37	59
„	„ „	08'511 ^a	Darker slip	6	79	111	43	40	58
„	„ „	05'625 ^a	Darker slip	8 $\frac{5}{8}$	90	113	42	29	57
„	„ „	03'567 ^a	Square lip	9 $\frac{7}{8}$	76	110	40	43	59
„	„ „	03'435	Thick lip, darker slip	12 $\frac{3}{8}$	75	106	36	42	61
„	„ „	06'212 ^a	Thick lip, darker slip	7 $\frac{1}{8}$	83	114	34	39	54
Coin, Domitian, 81—96	„ „	Hettner, Führer, p. 101, Abb. 369		11 $\frac{1}{8}$	77	108	39	41	54

TABLE OF STANDARD PROPORTIONS.—IX. *Continued.*

OLLÆ (Urns, Cooking Pots, &c.)

Date.	Provenance.	Reference.	Description.	Height	HEIGHT 100.			MARGINS.	
					Rim.	Bulge.	Base.	Rim.	Base.
A.D. Coin, Nero, 54—68	Cologne, Grave	Bonn. Jahrb., 114-5 p. 386, XXI., 10a	Grey	INS. $8\frac{3}{16}$	82	112	38		
50—100	„ „	p. 392 „ 17a	„	$8\frac{1}{16}$	70	106	35		
„	„ „	p. 387 „ 12a	„	$9\frac{7}{8}$	71	100	31		
Coin, Domitian, 81—96	„ „	p. 395 „ 21a	„ Darker slip	$7\frac{1}{10}$	77	105	33	33	45
83—122	Wiesbaden	ORL XXXI., XIII., 18		$6\frac{3}{4}$	91	113	50	26	41
98—117	Stockstadt	ORL XXXIII., X. (B), 28		$6\frac{3}{4}$	72	101	42	37	51
90—150	Nida, (Praun- heim Graves)	Heddern. Mitteil. IV. I., 14	Grey	7	89	121	45	30	64
	„	15	„	$8\frac{7}{8}$	82	110	40	37	55
	York	Museum Cat., plate XXI., 10	Steel grey	$8\frac{1}{8}$	81	106	40	27	59
100—150	Trier	Prov. Museum, Dr. E. Krüger, 03'499	Three girth grooves	$8\frac{3}{4}$	87	109	41	27	57
„	„	07'769a	Thick lip	$9\frac{1}{4}$	84	108	38	31	54
„	„	04'777a	Flat rim	$10\frac{3}{4}$	65	96	31	37	54
	Holt	Measured	Blue grey calcite	7	71	96	48	36	35
117—136	Arnsburg	ORL XVII., VII., 16		$7\frac{7}{8}$	77	111	39	46	59
100—150	„	„ 27		$8\frac{3}{8}$	74	105	36	36	60
„	„	„ 11		$8\frac{1}{16}$	65	100	32	45	58
„	Trier	Prov. Museum, Dr. E. Krüger, 06'665a	Bulged rim	$11\frac{1}{4}$	80	109	37	39	58
121—138	Zugmantel	ORL XXXII., Abb. 30, 6	Flat rim	$6\frac{1}{2}$	77	110	36	41	57
150—200	Trier	Prov. Museum, Dr. E. Krüger, 05'582a	Darker slip	$7\frac{3}{4}$	70	101	40	37	53
140—180	Newstead	L. (A) 2 XLVIII., 48	Latticed	6	82	92	50	15	33

TABLE OF STANDARD PROPORTIONS.—IX. *Continued.*

OLLÆ (Urns, Cooking Pots, &c.

<i>Date.</i>	<i>Provenance.</i>	<i>Reference.</i>	<i>Description.</i>	<i>Height</i>	HEIGHT 100.			MARGINS.	
					<i>Rim.</i>	<i>Bulge.</i>	<i>Base.</i>	<i>Rim.</i>	<i>Base.</i>
A.D. 140—180	Newstead, Grave	IV., 1	Latticed	INS. 9 $\frac{1}{4}$	68	80	40	16	33
Coin, Pius, 142	Corbridge	Site XXX.	„	8 $\frac{1}{2}$	72	85	42	15	38
	„		Grey to blk. latticed	11 $\frac{3}{16}$	68	83	41	15	38
	„		Latticed	7 $\frac{7}{8}$	65	76	35	19	28
	„	Site XVI.	„	7 $\frac{1}{16}$	67	77	36	10	35
	York	Mus.Cat., Plate XXI. 12	„		70	85	40	20	36
	Holt	Measured	„	8 $\frac{5}{8}$	69	83	40	20	34
	Carlisle	Museum, No. 215 plate XXI., 12	Calcite	10 $\frac{3}{8}$	70	78	40	15	27
	Corbridge	C 5	Buff to blk., calcite	7 $\frac{1}{8}$	69	75	40	9	23
250—300	„	Site XXXV.	Brown to blk., calcite	7 $\frac{7}{16}$	76	80	38	7	28
	York	Museum Cat., Grave VIII., 6	Light grey, latticed		74	74	34	0	32
	„	Over case B.		7 $\frac{3}{8}$	52	63	40		
270—330	Poltross-Burn	Gibson & Simpson, V., 6	Calcite, dark grey to black	10	63	72	38	13	26
	Cranborne Chase surface trenching	Pitt-Rivers Excava- tions, III., p. 99, XXXII., 5	Very dark	7 $\frac{1}{2}$	82	82	36	0.5	33
Coin, Con- stantine I., 306—337	Westbury	Museum Cat., XXXIX., 2	Latticed	7	87	85	35	+2	41

The marginal proportions in the last two columns indicate variations in the diameter and altitude of the bulge. The mode of obtaining them is explained on page 34. Their use is to make it possible to determine the approximate date of fragments large enough to furnish one or other of these proportions.

The table reveals the gradual decrease of the width of the bulge of ollæ,—the other two dimensions (width of rim and base) undergoing little change in the course of development. Before A.D. 150 the width is greater than the height of the vessel, but rises to as much as 20 % more. After that date the width is always less than the height, and falls to as much as 25 % less. Before A.D. 150 the upper margin (rim) is never less than 20 %, nor the lower one (base) less than 40 %, but afterwards the former sinks to less than 0, and the latter to 23 %.

Plate XXII.

14. LONG-OVAL BEAKER, in form resembling the elongated wooden cask known as a "wine-pipe," being nearly the same at both ends and bulged slightly in the middle. Wide straight rim obliquely inclined and weakly moulded. Foot obliquely expanded. A rough band defined by pairs of grooves and scored by latticed lines, with four or five roulette-notched rows above and below respectively, round the bulge, show that the vessel was made to be lifted with the fingers of one hand, and to hold a liberal allowance of weak liquor such as beer or wine.

Fumed dirty-grey clay, black coated and polished on the rim and shoulder to prevent the clay from adhering to the lips, and for cleanliness.

Height $7\frac{5}{8}$ ins., diams. of rim 4 ins., bulge $4\frac{7}{8}$ ins., base $3\frac{1}{8}$ ins.

Proportions, 50 : 63 : 50.

The type is represented among those from the Upchurch marshes in Rochester Museum, and is a developed form of Belgic *Schlauchgefässe* (swill-pot), from the early camp at Haltern (B.C. 11—A.D. 9). Lœschcke, *Haltern*, V., p. 281, XXIV., 15. It is recorded among the Belgic and allied wares from the Rhætian fort on the Upper Danube at Faimingen, where a number of La Tène survivals have been found, (Drexel *Faimingen*, XI., 19), dating from the end of the I. or early II. Century.

Examples of a closely allied type in Colchester Museum, derived from the kilns uncovered on the north of Lexden Road, near Colchester, are figured by C. Roach Smith in *Collectanea Antiqua*, vol. VII., plate V., 1, 6. Others in Trier Provincial Museum of the earliest type in *terra nigra*, are derived from kilns discovered in the vicinity, where they were manufactured.

15. HANDLED BEAKER IN THE FORM OF A WOODEN CASK (barrillet).

Handle vertical between two sets of ribs to represent hoops, numbering 6 above and 8 below respectively.

Brittle brick-red clay, rendered impervious by steeping in a well levigated slip of the same clay.

Height $5\frac{1}{2}$ ins., diams. of rim $2\frac{1}{8}$ ins., body $3\frac{3}{8}$ ins., base 2 ins.

The form is much commoner in glass. Kisa, *Die Antiken Gläser ...zu Köln*, plate VIII., 73; Behn, *Röm. Keramik*, form 329, Nos. 680 and 1133, &c.

16. SMALL PEDESTALLED DRINKING CUP. Straight rim $\frac{7}{8}$ ins. wide, obliquely inclined, bordered by grooves round the outside margins, body globular.

Coarse, fumed, soft-grey paste.

Height $4\frac{1}{4}$ ins., diams. of rim $2\frac{7}{16}$ ins., body $3\frac{3}{8}$ ins., base $1\frac{13}{16}$ ins.

17. BELL-MOUTHED CUP, with strongly moulded profile. The form is imitated from a rare terra sigillata cup illustrated in C. R. Smith's *Cat. of London Antiquities*, p. 25, No. 98.

Fumed grey clay with a darker surface produced by steeping.

18. RIM FRAGMENT OF CARINATED BOWL, form 29, Drag. Below the lip and at the angle of the side girth-grooves.

Hard dirty greyish-white clay, containing sand grains, blue-grey at core; surface polished.

Original diameter 8 ins.

Surface decay and the absence of the base make doubtful whether this bowl, when complete, belonged to the true terra nigra type of Ritterling, *Hofheim*, p. 79, VI., 18, described as Belgic ware. Whether or no the form is similar, and Drexel, *Faimingen*, p. 77, Fig. 5, profile 4, describing a similar fragment, grey-fumed and surface polished, under the head of "Belgic and allied wares," assigns to it a date of about 100 A.D.

The form and that of the sigillata bowl, form 29, with embossed ornament, go back to a common prototype, the La Tène form, illustrated by F. and N. Thiollier, *Fouilles du Mont Beuvray*, Album, plate XXVI.

Several fragments of the same type, including one with the whole of the incaved base with foot-ring, were found in a deep pit at Wilderspool, during excavations in 1910. The fragment illustrated, though small, is interesting owing to its origin and affinity to the early sigillata bowl of La Graufesenque.

19. FLAT-RIMMED OR FLANGED BOWL, type 56, Læschcke.

Fumed grey soft clay.

Height $3\frac{3}{8}$ ins., diams. of rim $7\frac{5}{8}$ ins., base 3 ins.

The type of dinner bowl or porringer, German *essnapf*, of the soldiers garrisoning the forts throughout the northern provinces of the Empire from Faimingen on the Upper Danube in Rhætia to Holt-on-the-Dee in the west of Britain, during the I. and early II. Centuries. It is often found partly coated with soot and blackened by use as a cooking utensil, and associated with a lid for which its flat rim is evidently adapted. In one recorded instance it was used as a cinerary urn (see below). Its usual ornaments are grooves on the surface of the rim and round the body, or wavy or latticed lines round the latter instead.

Being of Italian origin, it made its appearance in the early camp at Haltern (B.C. 11—A.D. 9), along with the legions, but

was made subsequently at Xanten, of very sandy clay, in fumed La Tène technique.* It attained its widest distribution in the Flavian-Trajan period (A.D. 69—117).

In the time of Hadrian, the middle of the body becomes rounded and slightly protuberant, and the lower stage has a distinctly concave profile. Afterwards it was superseded gradually by other forms, in Britain by the straight-sided, and in Germany by those with sharply turned-in rims.

Löeschcke, *Haltern*, V., p. 237, type 56, plate XX., 20; Abb. 31, 12 (B.C. 11—A.D. 9).

Poppelreuter and Hagen, *Bonn. Jahrb.* 114/5, p. 380, XXI. 3a. (Before A.D. 14), Cinerary urn.

Ritterling, *Hofheim*, VI., 31 (A.D. 40—60).

Ritterling, *Wiesbaden*, XIII., 25 (A.D. 83—121).

Drexel, *Faimingen*, XI., 20; XII., 3, 7 (A.D. 100—240).

Winkelman, *Pfünz*, ORL XIV., VII., 2 (A.D. 98—234).

Behn, *Röm. Keramik*, Form 234/5, Nos. 769, 830, 831.

Wolff, *Heddernheim*, grave field, XII., 7, p. 52 (A.D. 50—133).

Wolff, *Heldenbergen*, ORL XIII., plate III., 11 (A.D. 117—138).

Behn, *Röm. Keramik, Rheinhessen*, No. 769, (1st half of III. Cent).

Drexel, *Stockstadt*, ORL XXXIII., XB., p. 116, 2 (A.D. 110—251).

Jacobi, *Saalburg*, Abb. 63, 1 (A.D. 100—250).

Ward, *Gellygaer*, p. 77, X., 5 (end of I. to early II. Century).

Gibson & Simpson, *Poltross-burn*, p. 447, plate III., 1—6 (A.D. 120—180).

Curle, *Newstead*, p. 249, plate XLVII., type 37 (A.D. 80—100).

Bosanquet, *Housesteads*, p. 297, Fig. 55, 9.

Colchester Museum, Joslin Collection, grave group 89, 484.

London, Guildhall Museum Cat., p. 84, No. 96, plate XLI., 6.

Corbridge, from deep trenches of the early period (A.D. 75—100).

20. CHEESE-SQUEEZE, in the form of a small dish with straight sloping sides, plain rim, and base divided into three concentric grooves by three conical ridges about $\frac{1}{2}$ in. and a central hollow cone $\frac{7}{8}$ ins. high. In each groove are three $\frac{1}{8}$ in. holes triangularly arranged opposite the blanks in the grooves adjoining (not radially as shown in the drawing).

Coarse, hard, dirty-grey clay.

Height $1\frac{11}{16}$ ins., diam. of rim $5\frac{1}{4}$ ins., base $4\frac{1}{4}$ ins.

*Fragments and wasters of this type of vessel are now being found in great quantities, and the kilns where they were made uncovered at Holt near Chester.

Such utensils are not numerous. The following have been recorded in this country:—

Proc. Soc. Antiq., London, 2 Ser., XVI., p. 172-3, found in Northants.

Colchester Museum, Jarmin Collection, example in grey clay, and Joslin Collection, No. 819, base in white clay.

Peterborough Mus. of Nat. Hist. from Castor.

Bruton, *Melandra*, II. Report, 1909, p. 32-3, Fig. 1.

Plate XXIII.

21. TRIPLE VASE, consisting of three small pots, with beaded rim and contracted base, having internal communication at the widest part by small holes pierced through the sides and ligatures by which they are triangularly conjoined. (Imperfect).

Fumed dark-grey (unglazed) clay.

22. Another example is of coarse, soft, red clay, and consists of three smaller pots similarly conjoined.

The pots in another imperfect example, not illustrated, are larger and joined by means of a triangular slab of clay, pierced with communicating holes.

Many examples of different types are recorded, going back to the period of the lake dwellings (Munro, *Lake Dwellings of Europe*, p. 43, Fig. 9, No. 23, Lake Dwelling of Auvernier, Lake Neuchâtel).

The discovery in Wales of a mediæval "fuddling-cup," consisting of six small pots, similarly arranged, and communicating by holes in the sides, so that he who tries to drink one must drink all, has led to the suggestion that the triple vases in question were similarly employed. The latter are usually described as flower vases.

23-6. FEEDING BOTTLES FOR CHILDREN (tettines).

Two of those represented, Nos. 23, 24, plate XXII., are of ordinary fumed clay; the fourth, No. 26, is of similar ware, coated with a darker slip; No. 25, of white pipe-clay.

They take after the other drinking vessels of the period to which they belong. No. 24 is probably the earliest in possessing the inclination to width, oblique lip, moulded foot and broad basis of late I. or early II. Century beakers.

No. 23 has a slenderer pear-shaped body, but retains enough symmetry and evidence of good workmanship to be attributable to the late II. Century.

No. 26 is coarse and of careless execution. It tapers rapidly upwards to a plain-ringed lip; is caved in strongly below to an unduly small foot. These are attributes of III. Century.

No. 25 is of still coarser clay, and drawn in to a merely cylindrical neck and foot, like the bulbous beakers and goblets of the IV. Century. (See Table III.)

They are all provided with a tubular spout, but are without handles.

Clear evidence of their use as children's feeding bottles is afforded by an example in the Colchester Museum, Joslin Collection, from grave group 124 (No. 1115), which included a number of toys, and a child's bust in yellow-glazed St. Remy ware of the early I. Century, and coins of Agrippa and Claudius, and therefore attributable to about A.D. 50. It was of the same kind of yellow-glazed ware, and turbiniform—that is, with a wide conical bulge low down on the body, which appears to be a typical I. Century form, as a similar one from the first century necropolis of Roanne, France, is recorded by Déchelette, I., p. 45, Fig. 28. In the same museum are a large number of varied form, material and technique, including sigillata, yellow-glazed ware and glass.

Plate XXIV.

RIMS OF MORTARIA.

The rim is the only salient feature of the mortarium by which it is distinguishable into distinct types. Of these there are three early original ones, which become, in the course of development, expanded into at least seven, viz.:—

1a. *The upright rim* (type 59, Lœschcke), which appears at Haltern (B.C. 11—A.D. 9), and is the prevailing one in Germany during the Augustan period, but occurs in Britain principally in the revived sigillata, form 45, Dragendorff, with lion or bat-faced spout, of the II. and III. Centuries.

1b. *The upright collar* (or wall-sided mortarium), a developed form, represented by No. 14, plate XIX., and in the Colchester Museum, where it is associated with the well known Colchester Vase, decorated round the side with gladiators and animals *en barbotine*. It no doubt corresponds with the wall-sided mortaria

discovered by Artis beside the kilns in which they were made at Castor (*Durobrivæ*).

2a. *The horizontal or flat-curved rim* (type 60, Lœschcke), derived from Upper Italy, was brought to Haltern in Germania Inferior along with the legions during the Augustan period, and no doubt reached Britain in a similar way at the time of the Claudian invasion (A.D. 43). It is represented in most of our museums. (Curle, *Newstead*, p. 263, Fig. 34, Nos. 1—7). From the end of the I. Century it was gradually expelled by a developed form of the same type, 2b.

2b. *The bead and roll rim* (Lœschcke, *Haltern*. V., p. 243, Abb. 33, 16), which prevailed in Britain and on the Continent during the II. and III. Centuries, is developed from No. 2a by becoming more and more down-bent or hooked. (Curle, *Newstead*, p. 263, Fig. 34, Nos. 8—15; Jacobi, *Saalburg*, p. 246, Fig. 63, Nos. 12, 22—26; Gibson & Simpson, *Poltross-burn*, p. 448. plate IV., Nos. 1, 2, 4—10, &c.

2c. *The knobbed rim* (Gibson & Simpson, *Op. cit.*, plate IV., No. 3; Jacobi, *Op. cit.*, Fig. 63, No. 8), developed from 1a by filling or thickening the under portion of the curve, is ascribed to the first period of Poltross-burn, A.D. 120—180.

3a. *The flanged rim* (ORL XIV., *Pfünz*, plate VII., Nos. 2, 3, 6, 8, 9, 15), the prevailing one in the Rhætian *castella*, along with so many other La Tène survivals. It is stated by Drexel (*Faimingen*, p. 97), to be derived from an early Belgic or terra nigra flanged bowl (*Op. cit.*, p. 77, Abb. 5, 2), as shown by the flange of both becoming more and more down-bent and the preference for colour-coating displayed by both. The flanged mortaria often show on the outside and inside of the rim radially painted stripes in red pigment.

The latter type is represented in the Museums at South Shields and at Corbridge. It is the latest form appearing at *Faimingen*, destroyed about A.D. 240.

3b. *The hammer-head rim* (Gibson & Simpson, *Poltross-burn*, p. 452, plate V., Nos. 1—4, third period, about A.D. 270—330). Its development from type 3a is traced by Drexel, *Op. cit.*, p. 97, through the form of mortarium with obliquely inclined collar twice grooved round the outside, which occurs at *Pfünz*, plate VII., 9, and also at *Faimingen* as above stated;—examples with the same concavity, $\frac{1}{2}$ in. to 1 in. wide, bordered by a nick below the inside

lip and darker red colour-coating have been found at Corbridge and at Wilderspool, 4 feet down in a pit—an identity which is too perfect to be accidental. Numerous transitional forms between the latter and the hammer-head type have also been obtained at Corbridge.

Examples of the hammer-head type, usually in hard white pipe-clay, with 4 to 6 grooves, are recorded at Poltross-burn (*Op. cit.* p. 452, plate V., 1—4) in the third period deposits (about A.D. 270—330), and occur in the latest strata of Corbridge and Wilderspool. It was the prevailing type during the latest period of the wall of Hadrian, IV. Century.

27. RIM FRAGMENT OF UPRIGHT-SIDED MORTARIUM, type 1b.

Hard, white-clay, with patches of red-brown coating. Studded with particles of iron on inside base. The form of spout is peculiar.

Original diam. $11\frac{3}{4}$ ins., height of rim 2 ins. nearly.

28. SIDE FRAGMENT OF MORTARIUM, type 2b.

Clay very hard and blue-black, apparently by overfiring, studded on inside base with iron scoriæ.

Original diam. 8 ins.

The potter's name stamped across the rim—ΛΤΟΟΙ (retrograde) = ICOTASI? found also in equally rough lettering at Wilderspool. May, *Warrington's Roman Remains*, p. 64.

29. RIM FRAGMENT OF MORTARIUM, type 2b, studded with stone particles on inside base.

Original diameter 12 ins.

III. BRITISH GREY-BLACK FUMED WARE, CONTAINING CALCITE AND QUARTZ PARTICLES.

This kind of ware is held to be of exclusively British manufacture because no corresponding examples of the Roman period are recorded by Continental authorities or contained in Continental museums, and it long preceded the Roman occupation in this country. Sand appears to have been preferred by the Romans for mixing with their clay to increase the fire-resisting qualities of their cooking utensils, and for this and other reasons, one of which may be that the Roman tradition was more tenaciously retained in the military capital than in the more backward native or provincial settlements, this rustic type of pottery is poorly represented in York Museum.

It has already been stated that a specially prepared body-clay was used in the manufacture of cooking-pots, consisting of strong fat clay containing a large admixture of silica in the form of sand, flint, or quartz particles (prepared by pounding), pounded pottery, or calcite, to render them more or less fireproof when exposed to strong heat or sudden changes of temperature.

The use of calcite (crystalline carbonate of lime) for this purpose goes back to the prehistoric period, pottery containing it and the mines from which it was extracted near at hand being described by H. W. Sandars,* as existing at Furfooz, in the province of Namur, Belgium.

*Sandars, *Archæologia*, vol 62, part I., p. 117-8, describing the use of the deer-horn pick in pre-historic flint, calcite, copper, salt, and tin mining. says it was found in old workings at Furfooz, in the province of Namur, Belgium, from which calcite had been obtained for the purpose, principally, of mixing it with clay employed in the neighbourhood in the manufacture of pottery. From the calcite extracted, the most suitable portions were selected and then broken up by hammering with a deer-horn implement or with stone mauls, to the size required for admixture with the clay. The pottery, Fig. 17, was very coarse.

H. Wilmer, *Proc. Soc. Antiq. London*, 16 March, 1908, 2nd Ser., XXII., 164, in describing Late Keltic remains on the Coast of Brittany comparable with the Red Hills of Sussex, "Report of the Red Hills Committee" says—The pottery appears to have been made by hand as well as on the wheel. The black variety which predominates in quantities shows a strong admixture of quartz and mica. Many of the examples are decorated with incised lines. Fig. 25 (7) and 25 (6), are referred to as typical of Late Keltic work. The latter is grooved on the under-base, and the former is formed of black clay, with a considerable admixture of quartz.

Francis W. Reader, Appendix on Pottery, &c., found in the Red Hills of Essex, mentions a pedestalled urn of poor character from Red Hill III.,

When used for pottery of the Roman period, it must be looked upon as an adulterant or inferior substitute for silica, since exposure to strong heat converts calcite into quicklime which absorbs water and quickly dissolves away. Examples of this tendency are to be seen in the Tullie House Museum, Carlisle, where an otherwise perfect cooking-pot (No. 215) is pitted over the entire surface with holes, some of which go through the side, owing to the dissolving out of the calcite particles originally mixed with the clay and of which very little remains. The other similarly pitted examples are from the Poltross-burn Mile-castle, and are ascribed to IV. Century. Gibson & Simpson, *Poltross-burn*, p. 453.

Cooking-pots from Silchester in the Reading Museum, the clay body of which is filled with grains of calcined flint, are much better preserved. They are supposed to be a native ware in use long before the Roman period, and to have been made there throughout the occupation.† (Fox & Stephenson, *Short Guide to the Silchester Collection*, 4th edition, 1910, p. 30).

One or two examples recently found at Corbridge, and not yet published, belong to about the IV. Century. A rim fragment of a mortarium of the same ware, also found there, is of the hammer-head type, with grooves on the surface of the collar, but roughly made.

Fragments are recorded at Elslack (May, *Yorks. Arch. Journal*, Vol. XXI., p. 161), and have been found abundantly at Ribchester (not published).

Langenhoe, Essex, Fig. 8, B., "the paste being of a very poor mixture, containing lumps of flint."

"Another well-known class of pot is evidenced by the fragment, Fig. 9 (4), which has the burnished diagonal lines forming the 'trellis' or 'lattice' pattern."

It was concluded that the pottery found in the Red Hills belonged to the late Keltic period, and dated from the first-half of the I. Century of our era.

† Geo. E. Fox and Mill Stephenson, "*Short Guide to the Silchester Collection*," in the Reading Public Museum, p. 30. The examples of British ware from Silchester in the Reading Musum are in Case XI.

In the Short Guide it is stated that—"They differ from all other pottery from the site in that the paste or clay of which they are made is filled with grains of calcined flint, and that most of the vessels are hand-made, not thrown on the wheel. There are, however, at the end of the shelf a few vases of this same paste which are well-shaped and wheel-turned, but only a small number of these have been found. This was probably a native ware in use long before the Roman period. It was employed in the town for the roughest purposes."

It may be remarked that the great amount of distortion and contraction in drying and baking that the dense clay undergoes produces on the sides of some examples the appearance of their having been turned on the wheel in one part, and simply hand-made in another part of the same vessel, numerous small holes going right through the sides.

The Carlisle vase (No. 215), is in this useless condition, which may account for its having been thrown away unbroken.

Hutchinson, *Proc. Soc. Antiq.*, London, 2nd Series, XXI., p. 217. Pottery from late Keltic graves found at Haslemere, Surrey, says—"The dark-brown paste, with traces of a black vernia, and containing siliceous grains, so frequently seen in urn-fields of this date, is that most abundantly represented."

It also occurs on the Continent:—Kœnen, p. 70, plate IX., describes rough vessels of pre-Roman technique, found in the Rhine district, as appearing in the fracture, reddish, grey-black *bröcklich* (crumbly) and *brandartig* (burnt-like), and as exhibiting a considerable addition of sand, quartz, and other hard substances, whereby they appear porous and not so ringingly hard-baked as Roman vessels in general. These are of pre-Roman technique, cf. IX., 18a.

VARIETIES OF SHAPE.—The principal member of the group is the cooking-pot or olla. The shape is uncommonly uniform and undergoes little alteration or development throughout the period referred to, so that its utility for dating purposes is not great. The body is an elongated ovoid, with a consistently convex profile, but in the latest period of its survival, becomes almost conoid, with a slight taper downwards from shoulder towards base.

The shoulder is high and somewhat suddenly incurved, and the rim turns outwards from it with an angular bend, to form a nearly $\frac{1}{4}$ round or cavetto curve. The lip is not thickened until, at a late date, the rim becomes often more flatly outbent, and is grooved or ledged round the inside for a lid.

Mr. Arthur G. Wright, Curator, Colchester Museum, has kindly examined the proofs and furnished a large amount of information. Mr. W. Burton, M.A., has also gone over the proofs and criticised the technical descriptions, but for these he is not responsible.

CORRIGENDA ET ADDENDA.

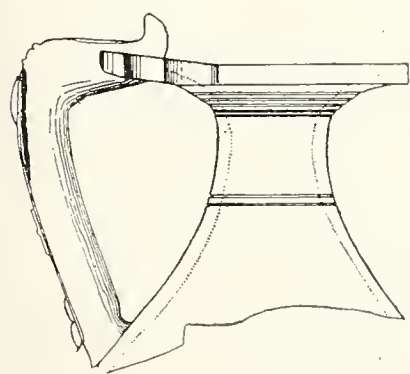
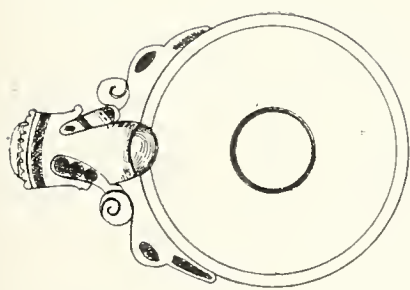
Part	Page	Lines, &c.	Error or Omission.	Alteration or Addition.
I.	7	Line 13 ..	IANVF add	Barthel considers this stamp should be expanded IANV (ARIVS) and as that of a different potter to the well known IANVS.
„	8	„ 4 ..	ALLONI should be	ATTONI.
„	11	Foot of Plate II.	Size ($\frac{2}{3}$) „	$\left. \begin{array}{l} 1 : 2.24 \\ 1 : 1.44 \\ 1 : 2.24 \\ 1 : 2.2 \end{array} \right\} \begin{array}{l} \text{Plates II., V., VI., are reduced} \\ \text{to rather less than } \frac{1}{2} \text{ linear ; Plate} \\ \text{III. to rather less than } \frac{2}{3}, \text{ but the} \\ \text{scale is evidently not a definite} \\ \text{or uniform one.} \end{array}$
„	12	„ III.	„ „	
„	14	„ V.	„ „	
„	15	„ VI.	„ „	
„	„	Line 8 ..	Form 31 „	Form 18.
„	„	„ 11 ..	End of I. Cent. „	First half of I. Century.
„	„	„ 15 ..	Form 31 „	Form $\frac{18}{31}$
„	„	„ 20 ..	„ „	„
„	„	Last line ..	.. .. add	This example belongs to the beginning of the I. Century.
„	22	First line ..	II. Cent. should be	III. Century.*
II.	13	Table III., Examples 7—9	Plate V. „	Plate VIII.
„	28	Line 19 ..	.. .. add	The ornamentation and proportions are characteristic of the I. Century.
„	29	„ 23 ..	Food should be	Foot.

Where used Kœnen should be Koenen.

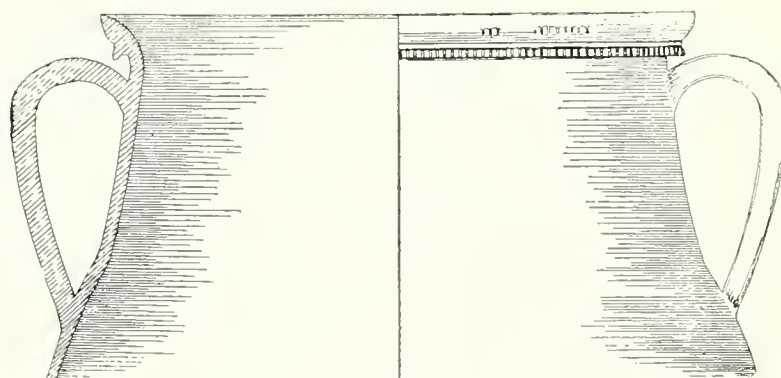
* In the separate sections as they appeared in the Journal this is Section II. page 7.



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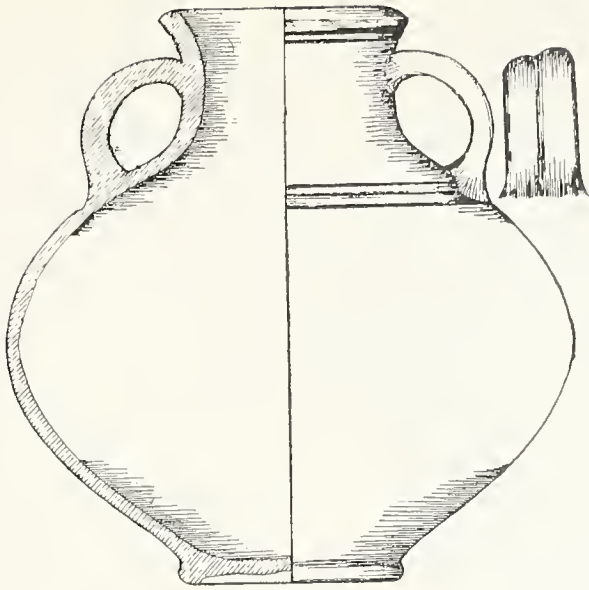


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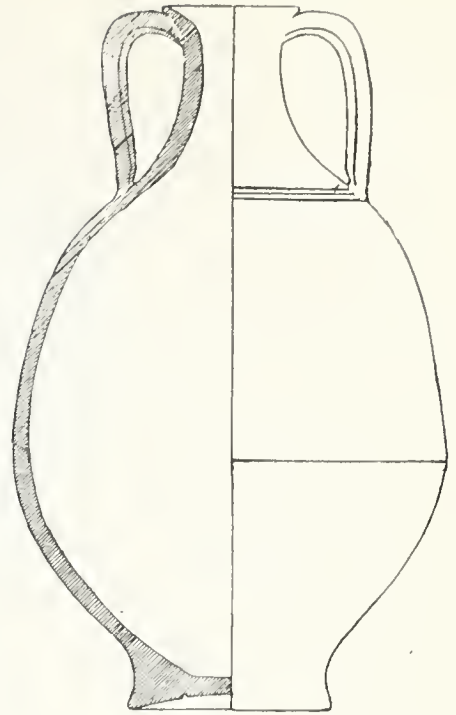
1. EGG-SHELL WARE CUP (Full Size).

2. NECK AND HANDLE OF EWER.

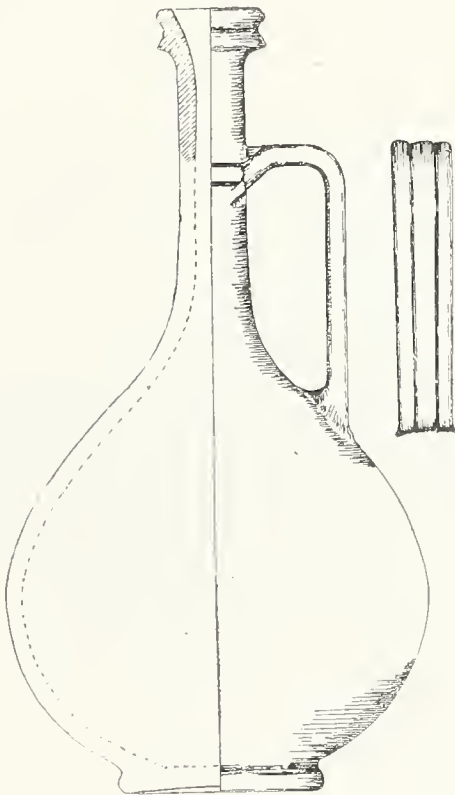
3. SIDE FRAGMENT OF CANTHARUS.



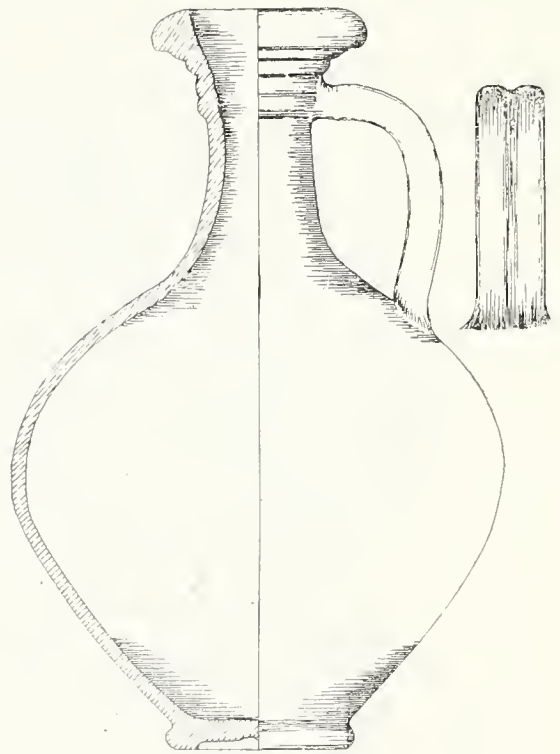
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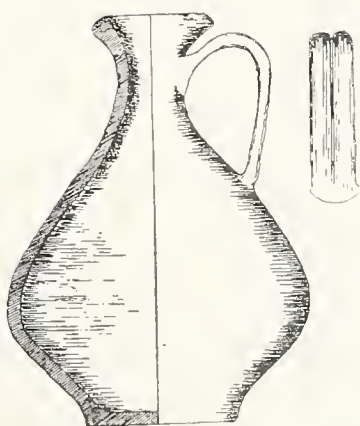
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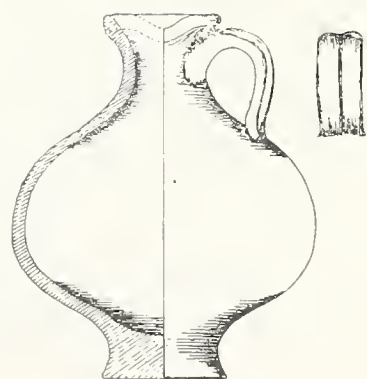
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9

TWO-HANDLED LAGENÆ, ONE-HANDLED FLASK AND FLAGONS. ($\frac{1}{4}$ Size).



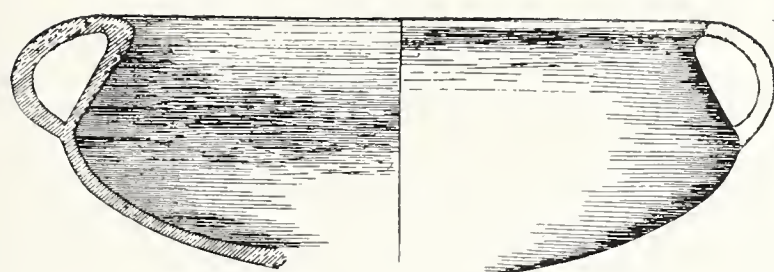


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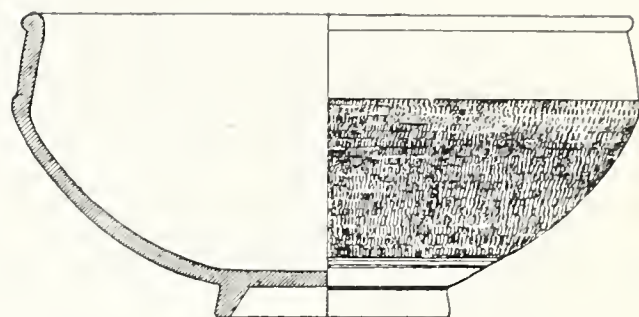


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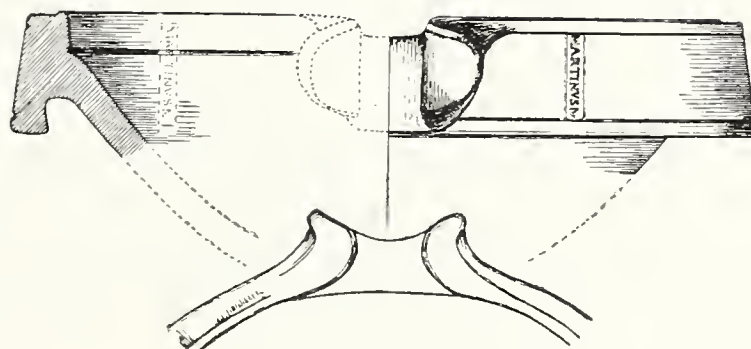
HONEY POTS. (Size $\frac{1}{4}$).



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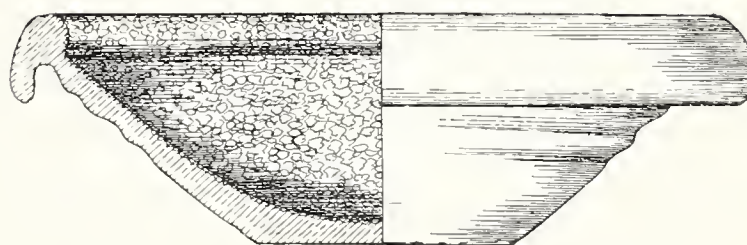
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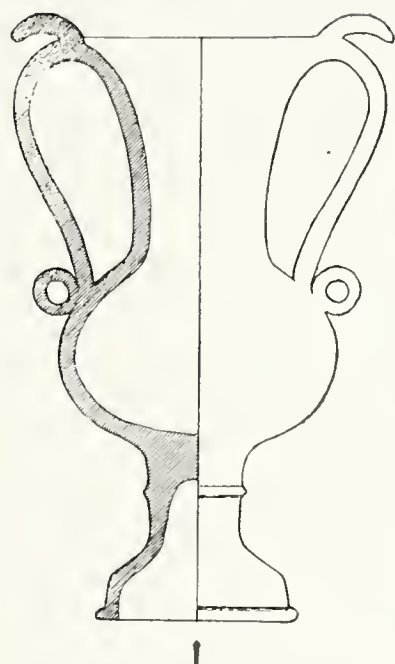


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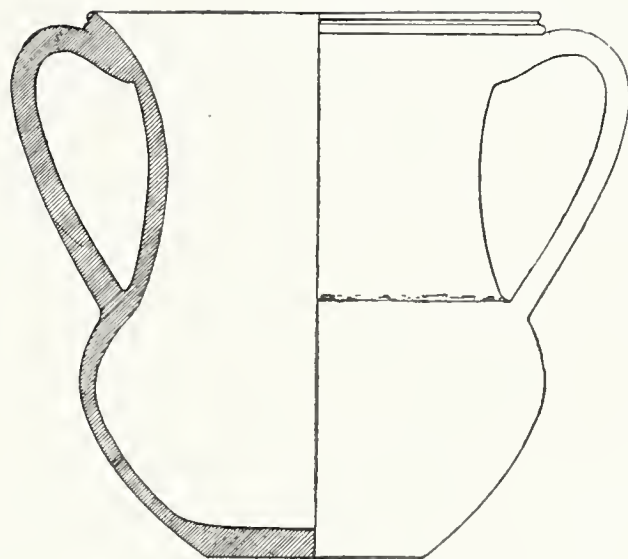


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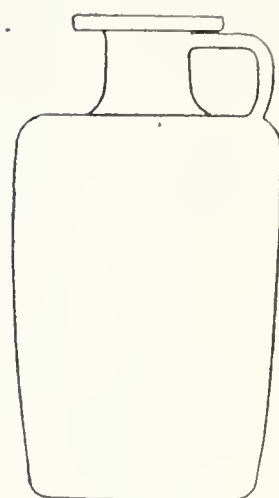
TUREEN, BOWL, MORTARIA AND UNGUENT POT. ($\frac{1}{4}$ Size).



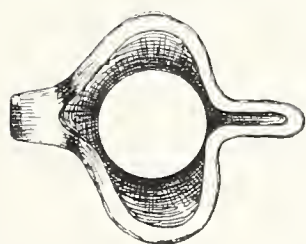
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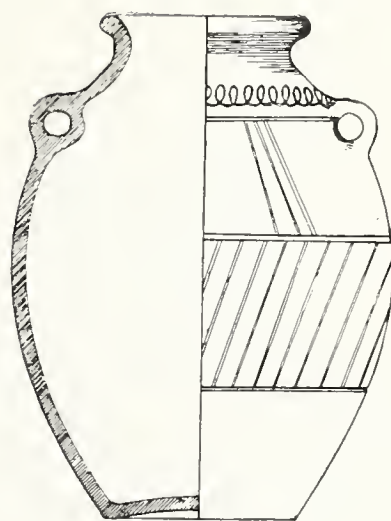
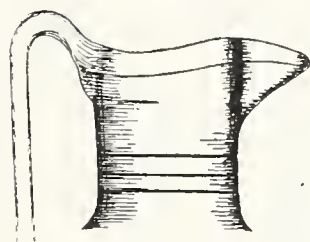
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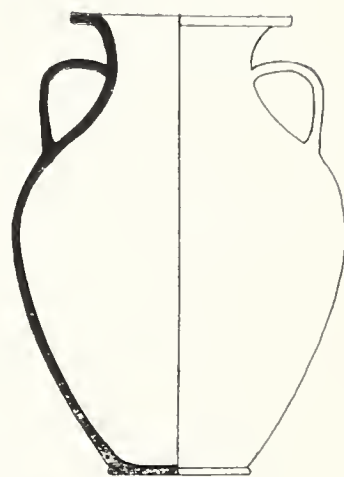
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4



5



6

CANTHARI, FLASK, HANDLED PITCHER, NARROW-NECKED OLLÆ.

Nos. 1—4, $\frac{1}{4}$ Size.

Nos. 5—6, $\frac{1}{8}$ Size.



7

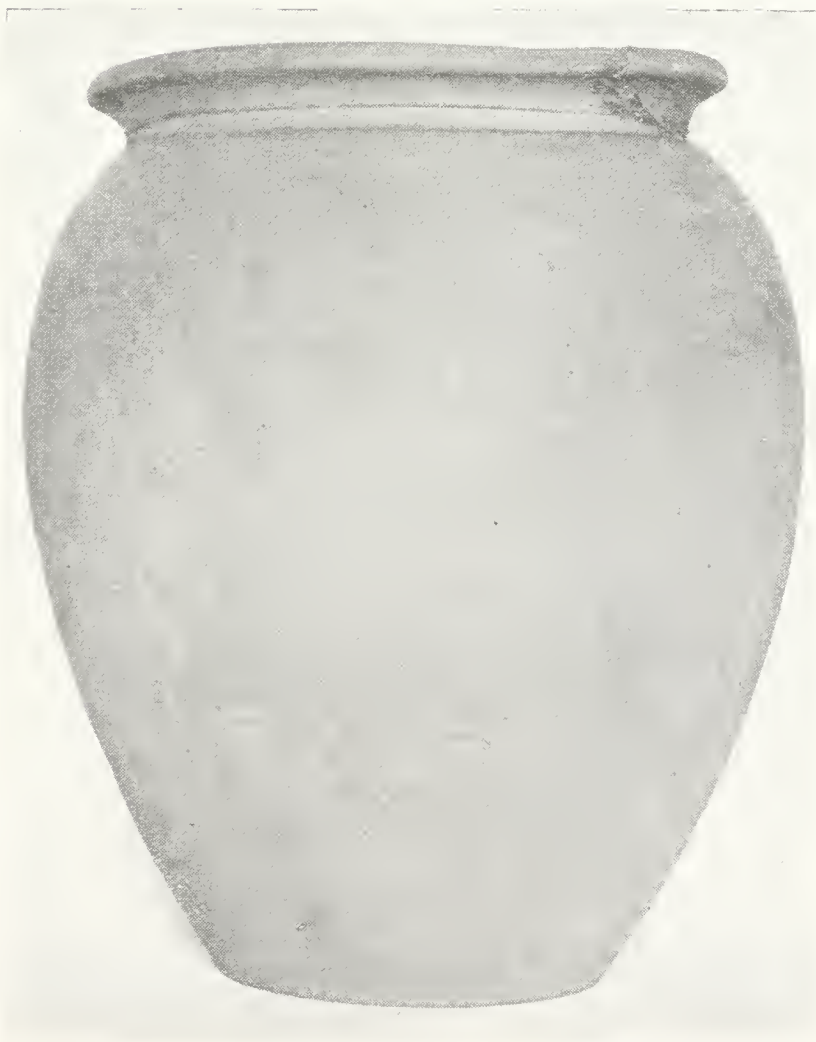


8

NARROW-NECKED OLLÆ.

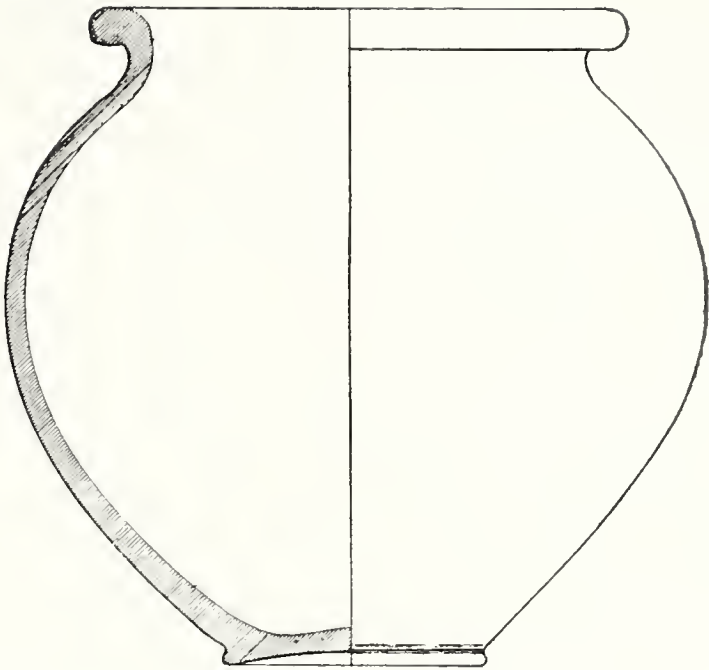


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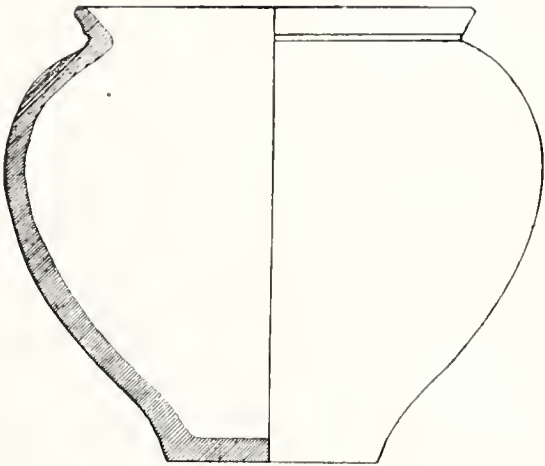


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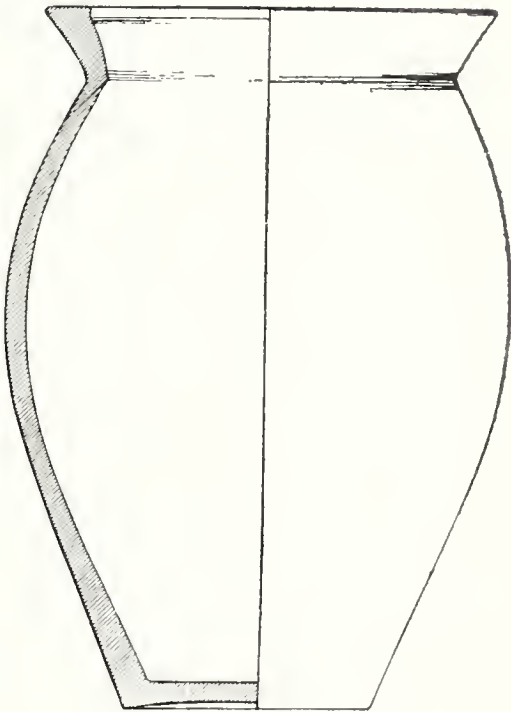
OLLÆ.



10

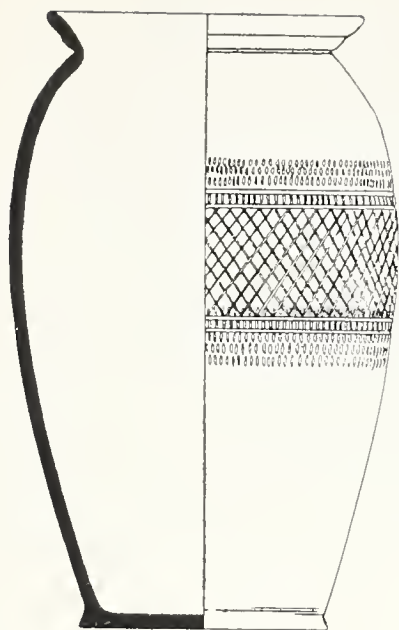


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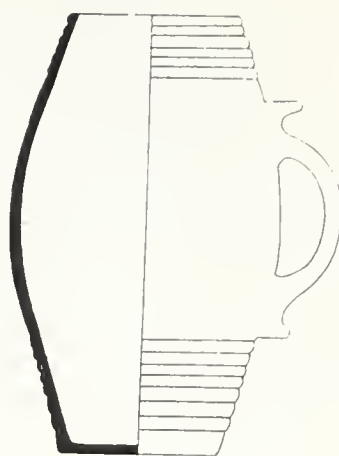


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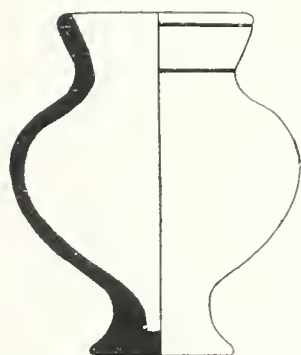
OLLÆ. ($\frac{1}{4}$ Size).



14



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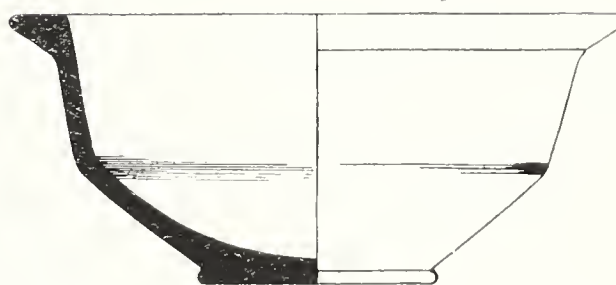
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19



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21 and 22,
TRIPLE VASES.

21



22



23

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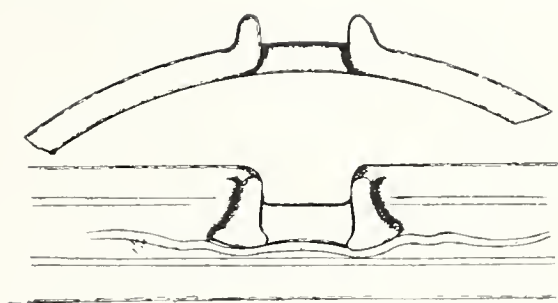
23, 24, 25, and 26,
FEEDING BOTTLES.



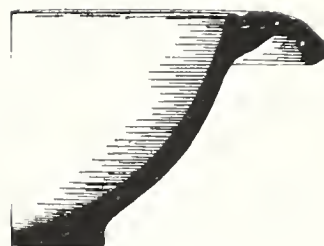
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29

MORTARIA. ($\frac{1}{4}$ Size).

NOTES ON FIRE INSURANCE MARKS

By C. K. HITCHCOCK, M.D., M.A.

THE collection and preservation of these Marks, at one time a definite and inseparable part of a Fire Insurance Policy, has of late become of increasing interest to all who desire to hand down to future generations uses and customs which have at one time formed an important part of our social life.

The destruction of old buildings to which these plates were affixed has led in times past to the loss of some that a collector now would "give his eyes for," as the saying is.

An article in the *Daily Graphic* of 19th February, 1907, describing the collection of fire marks recently acquired for the Guildhall Museum, London, first attracted general attention to this branch of archæological study; and later the London County Council and the London Salvage Corps passed solemn resolutions that fire marks on any buildings to be pulled down within their authority should be preserved. These happenings stirred the interest of collectors throughout the country, and now, except for those who were early in the field, the risen market value of these has made the acquiring of a representative collection a difficult and expensive matter.

The writer of this paper has been among the fortunate early birds, and by limiting his collection to the marks issued by English offices has been able to get together a fairly representative collection, some of the more interesting of which are illustrated herewith.

A paper was read on this subject at a monthly meeting of this Society in 1908, and it is thought that a further communication will add to the interest in a collection which is now being formed in our Museum.

There appear to have been no organised Companies for the protection of houses from destruction by fire in this country until after the Great Fire of London in 1666. After this fire, which burned for four days, and in which property valued at Ten Millions sterling was destroyed, it is not surprising that considerable attention was given to the subject of Insurance, and between 1667 and 1721 no fewer than twenty schemes were inaugurated to transact Fire business.

In 1681, a Committee of the Council of the City of London settled £100,000 in funds and lands for the better securing and insuring inhabitants of the City and its liberties from dangerous accidents happening from fire. Of the twenty Companies referred to, only 8 existed as independent organisations in 1780—The Sun, The Royal Exchange, The Phoenix, and The Atlas are still flourishing.

We find the earliest mention of Marks in 1682, when the Fire Office established in 1680 issued a Badge, on which was represented a Phoenix, that fabulous bird rising from the flames unscathed. From this emblem, the Company was colloquially known as "The Phoenix," but it was really "The Fire Office," and only assumed the name of Phoenix in 1705. The earliest issue of The Phoenix Company had below the bird the word "Protection," and later the Phoenix Office had the word "Phoenix" below the emblem.

The emblem of the Sun was adopted by several Companies, as the "Sun," "Bath Sun," "Sarum Sun."

The earliest Marks were of lead, hammered, pressed, or cast. These had the number of the Policy stamped on, generally in recessed numbers, rarely in raised type, and very rarely painted on. Then came the age of stamped or pressed copper, rarely brass. Last of all sheet iron, either tinned or plain. These latter quickly rust and perish, and the execution and designs are mostly very poor and inartistic.

Early Policies were limited to £500, and if a large property was insured several Policies had to be taken out and a separate Mark affixed for each £500 assured.

There was until lately an interesting example of three old Marks of the Sun Office on a building in the Layerthorpe District of this City, and two on an old house in Bootham. These were the only examples in York of more than one Mark on a house. (They are depicted in the centre of the first plate illustrating this paper). In London, the writer has seen many public buildings with four Marks, and the Salop and North Wales specimen figured herewith is one of four from a house in Evesham.

The history of Fire Marks is particularly interesting as showing the conditions appertaining to the insurance of property against the risk of fire which existed over two centuries ago, a time almost identical with its inception as a regular business.

There appears to be a distinction made by some Collectors between Fire Marks and Fire Plates, limiting the term Fire Marks to the early issues on which the number of the Policy was stamped, or in rare cases painted, but either term appears appropriate. The date of the earliest—The Phoenix, Sun, Royal Exchange—would range from 1683 to perhaps 1790. Companies continued later to affix Marks, but they were not an essential part of the Policy after that date, and were not stamped with the number of the Policy. These later issues without the number of the Policy are those which are sometimes referred to as “Plates.” They are never of lead, generally of stamped sheet copper, very rarely of brass; and, the quite recent issues are generally of iron. The handsome, careful design and finish of the early Marks are noticeable. The demand for cheapness and production in quantity, and the lack of artistic design are accountable for some very poor specimens of the latest issues. The earliest Plates of The Sun, and that of the Phoenix with the word Protection underneath, are made of sheet lead hammered into a mould; the rest of the lead specimens are cast.

In early days, the Marks were undoubtedly removed when the Policies lapsed, as is shewn by an Order issued by the Directors of the Sun Office in 1719, “That all the Marks of relinquishers be at once taken down.” The Companies, however, as their business grew, would have been unable to keep up this regulation, and we find about the close of the 18th Century most Companies inserted in their Policies that the Insurance lapsed on failure to pay the premium on a certain date; and thus the old Marks were left on the houses meaningless and without interest, until the busy Collector found in them a fresh subject for his Museum.

The symbolism of many of these designs is an interesting study of itself. Some designs are just crammed with more or less fanciful or appropriate Emblems.

Take the Alliance, a London Company. They select one of the Towers of the Tower of London as their Emblem. Those who know the 12-feet thickness of these walls will recognize the discrimination of the choice. The stratification of the rock on which the Tower is built is perhaps conglomerate, but evidently the foundation is sound, for the Alliance has absorbed no fewer than 23 Companies, and is still going strong.

Then, look at the Royal Exchange. Not only have they taken that centre of the World's Money Market as their Emblem, but

they were and are actually in possession of part of that building for their Offices. The device of the Greyhound on the summit of the building, the Badge of the King's messengers, the gazehound as it would have been called then, keen of sight and discrimination, silent of tongue (no Greyhound utters a sound when out on business) a very embodiment of speed, possibly a delicate hint of the quick settlement of claims.

The second Norwich Union Plate has much interest which largely disappears in a plain commercialism of later issues ; the central idea of justice, the Victor's Wreath of bay leaves, the firm hand grip of friendship between, I suppose, the Insurers and the Insured, the Cornucopias ready to satisfy all claims, and the circular form of the device signifying that here are no loose ends.

The details of design in many other plates are an extremely interesting study.

A progressive economy of lead is noticeable in each succeeding issue. As the Offices became better known there was less need to advertise so conspicuously. An early Scottish Fire Mark weighed 9 lbs.

The Officers of the earlier Companies were specially protected from compulsory service to the State. There is a Crown Charter in the British Museum dated 1708 in which it states, "Care will be taken to obtain protections of the Government to keep the Exchange house men from being impressed or otherwise molested in their business."

Now, as to the uses of these Fire Marks :

First, the Companies originally each had their own Fire Brigade, and their services were confined to property insured in their own Office ; consequently, in the event of a fire, upon a Brigade's arrival on the scene if they did not see their own Mark on the building involved, and there appeared no chance of the fire spreading to any building in which they were interested, they just went home again.

The Firemen and Watermen employed by each Company wore Badges on their arm, both to shew their right to act for that Company and for protection against the Press Gang. Further, before the existence of the present day Survey Department, the messenger or fireman of the Company who affixed the Mark would be able to verify the statements of the assured, and ascertain more certainly that the building proposed for Insurance was actually there ; and the Regulations of the early Companies stated that "to

prevent fraud in getting any Policy after a house is burnt, no house is to be esteemed a secure house until the Mark hath been actually fixed thereon." The Marks were also paid for by the Insurers. There was an average charge of 2/6 for the Mark, also a charge for the Policy, about 4/- % for duty, and the premium was never less than 2/6 %--thus an insurance of £ 100 on a dwelling-house would cost, say 11/6.

The Hand-in-Hand also published this Regulation in their early days, but do not assign any reason for it. In 1731 this Office ordered that "the Marks are to be put up by the messenger within Seven Days after the Policies are taken out." The Regulations of the Sun Fire Office also stated that every person insuring shall have a Mark representing the Sun nailed up against their houses, which Mark is to be numbered with the number of the Subscriber's Policy, and there to remain so long as the Subscribers continued to pay their quarterages.

Now, all this clearly shows that the fixing of the Fire Mark in those days to the building insured was as much a part of the Contract, as, let us say, the payment of the Premium.

Secondly, in various Mob Riots, as in the Gordon Riots in London, and the Bristol Riots, the houses of obnoxious persons bearing these Marks were spared from burning, as the mob knew the loss would fall on the Insurance Company.

With this object of protection from mob law, the Plates were even hung on ricks and farmsteads in the Eastern Counties and in the West of England in the wild times of the repeal of the Corn Laws, and of the introduction of threshing machines, but about 1727 the Companies began to repudiate liability arising from the action of a mob.

A third use was, or more properly is, advertisement.

At an early time, the Plates were hung like shop signs outside the Offices of the Fire Insurance Companies, and they are still extensively used on the Continent, in our Colonies, the United States, and wherever English Assurance Companies are now doing business. It is told of some Insurance Companies that the present profusion of gaily coloured plates on houses in some Continental cities need not necessarily signify insurance, but merely that a small sum has been paid by the Company for the privilege of using the house as an advertisement.

Lastly, there is the superstitious feeling with regard to them. More than once the writer has been baulked in getting one from a

country village by the owner's firm belief that the house could not be burnt as long as the Mark stayed there. A modified idea is that they are lucky; as similarly old horse shoes are nailed over doors.

The different Marks may be conveniently divided into four principal types. First, those having in the field some object connected with fire, as Phoenix, Protector, this last, one of the rarest, represents a fireman in the costume of 150 years ago, most dramatically turning a hose on a building bursting with the most realistic and awe-inspiring flames—the bridge on which the fireman is standing is said to represent old London Bridge; second, a punning or emblematic reference to the name of the Company, *e.g.*, Bristol Union—a bundle of sticks; Farmers' Insurance Company—a wheatsheaf. This last is a very scarce Plate, not in the Guildhall collection, nor mentioned in lists of other Collectors. The Company was early absorbed in the Alliance. Gloucester Castle, Britannia, Globe, are further examples of this class. A third class is the Heraldic—Birmingham, Manchester, Salop, with the Arms of Shrewsbury—three leopard heads. The Salop is a scarce Plate. The curious reason that so few are in existence appears to be that most of the old houses in that district, being largely built of timber, have perished, and the Fire Plates with them. The specimen here illustrated has been through the fire, and was in a very dilapidated state when received.

Fourthly, miscellaneous—as Church of England, Royal, and several others in the collection.

The origin of the Church of England Assurance Company is interesting. It was founded some 100 years ago as a philanthropic agency to compensate poor villagers for the often total loss of their belongings, when a fire swept away perhaps a whole street of thatched cottages and left the occupiers homeless and with no worldly goods. It altered its title to "England Insurance Institution" in 1893, and the latter Company has gone out of existence.

The limit of space compels the omission of any extracts from the immensely interesting history of the Sun, the oldest present Fire Insurance Company in the world, possessing an unrivalled collection of old charters, policies, firemen and watermen's costumes and badges, old fire squirts and other primitive fire extinguishing appliances. The histories too, of the Royal Exchange, and of the Norwich Union which have been kindly supplied by the Secretaries of those Companies, must for the same reason be

merely mentioned though they form of themselves a record of Fire Insurance from early times. But some brief notes from the history of the Yorkshire Fire Insurance Company may fitly be recorded in the annals of a County Society.

As to the Plates of the Yorkshire : The first issue was of copper, circular, with " Yorkshire Fire Life Insurance Company, Established 1824 " around the edge, and a view of the Minster from the S.W. in good perspective. This Plate is not figured here but the second issue is shewn on Plate 1. The fourth and fifth, which I have not included in the photograph, have been issued solely for their Colonial and Foreign business.

The *York Herald and General Advertiser* of 5th June, 1824, contains an announcement headed " Yorkshire Fire & Life Insurance Office." The establishment of such an Office being desirable, etc. All persons interested, are requested to meet at the York Tavern on the 14th June, 1824, to consider the most expeditious means of carrying this into effect. (The York Tavern is now Harker's Hotel).

This project was at once confronted with the proposed establishment of the Leeds & Yorkshire Insurance Company ; but nothing daunted the scheme was followed up vigorously, for in the *York Herald* of 10th July, the following paragraph appears :

" We are glad to find that notwithstanding the aspersions cast by interested parties, the number of shares already taken by Noblemen and Gentlemen in the County leave no doubt of the establishment taking place."

In the *Herald* of 17th July, 1824, the announcement is made of a further meeting, to be held at the York Tavern on the 26th July, " to determine laws and regulations, and to appoint Directors and such Officers as requisite."

From the *Herald* of the same date, the following extract from the correspondence column shews the opposition to the proposal.

" It is amusing to observe the pains which certain parties are taking to persuade the Public that Insurance Companies are unprofitable, and that many of those which have been established have now been abandoned. On a cursory glance over the list of those departed Companies, which have been industriously circulated, we notice several which are to our knowledge still alive and flourishing but which have made

some alterations in their plans or names. This kind of statement is just about as correct as if we were to add to our week's list of deaths, those ladies who have changed their names from the single to the married state—". . . .

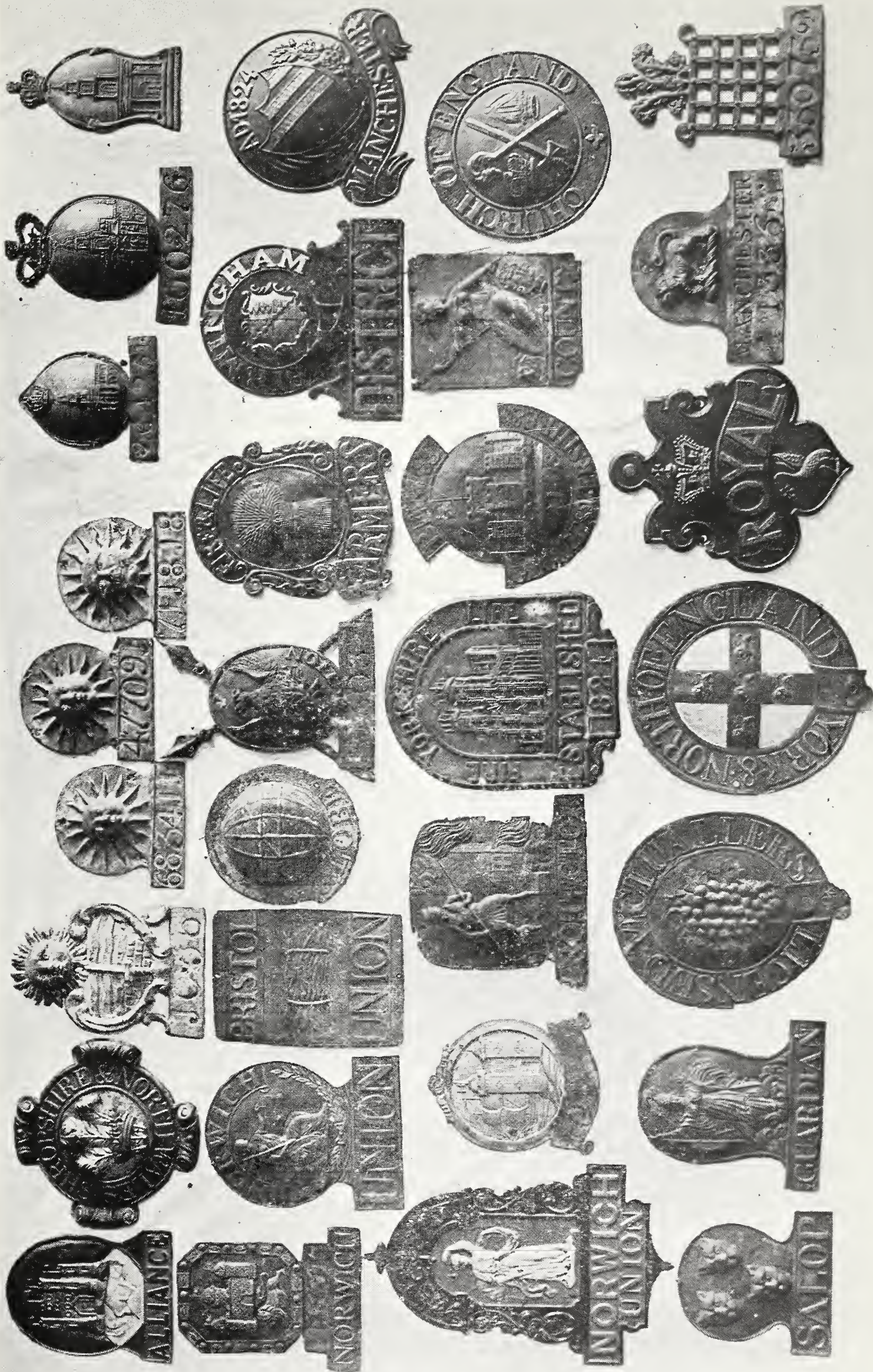
Then the query is raised "is there sufficient property to be insured in Yorkshire and the neighbouring districts to support an Insurance Establishment ? "

Another captious critic writes "is there property sufficient in the County to give the requisite security to insurers ? " and so on.

Notwithstanding these squibs, within a month over 7,400 shares of £50 were subscribed. A list of more than 70 patrons was published, headed by the then Archbishop of York, and by many of the Noblemen and principal families of Yorkshire, on the the 1st September, 1824, temporary Offices were opened in Coney Street. In October, 1824, the late Mr. W. L. Newman, was appointed 1st Secretary and Actuary to the Asssciation. The Office was removed to St. Helen's Square by September of the same year. Then additional land was bought on adjoining property, and the whole of the present Site was soon acquired for the development of the business.

In 1890, the Yorkshire took over the business of the North of England Fire Insurance Company, and in 1902 acquired the business of the Lion Fire Insurance Company, and in 1904 a considerable portion of the Fire and Accident Departments of the National Assurance Company of Ireland was also acquired by the Yorkshire. This follows the usual course in every business now-a-days of the smaller being absorbed into larger concerns ; and it is interesting that out of 21 County Fire Insurance Offices called by the name of their Shires in the Annual Register of 1856, the Yorkshire is the only one now surviving as an independent Company ; but the progress of this Company has been so continuous that I need not detail its more recent history, seeing it now has Branches and Agents all over the world ; that its income for 1911 was more than one million, whereas half-a-million was its whole capital at its foundation ; and, that all we householders have to beseige its doors and beg to be relieved of our burdens under the "Employers' Liability Act."

The very dilapidated Fire Mark of the Sun on Plate III. is one of the rare Iron Marks of that Office, the Policy Number appears to be 821147. The Bath Sun and the Sarum Sun are also figured on this Plate.





MANCHESTER, 1771.

ROYAL EXCHANGE, 1720.

BATH SUN, 1767.



THE OPENING OF A TUMULUS NEAR PICKERING.

BY JOHN L. KIRK, B.A., ETC.

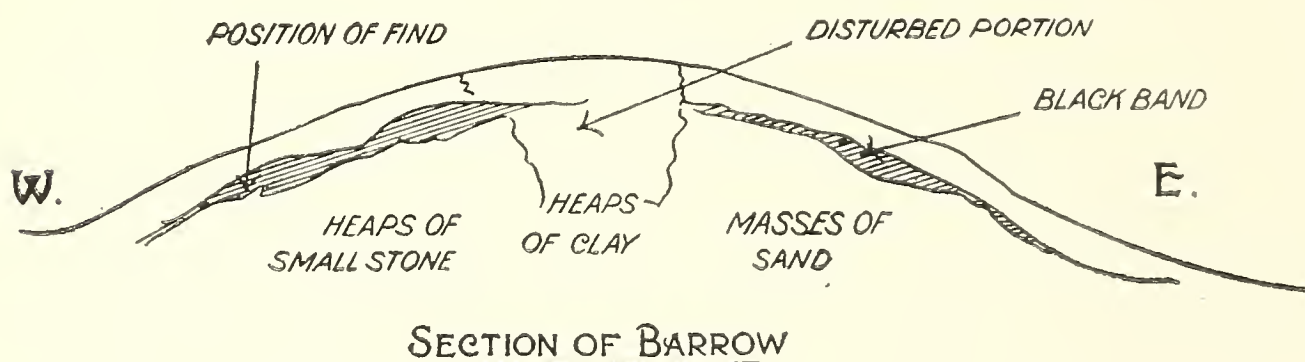
During February, 1911, Mr. Oxley Grabham and myself set out to try our luck at opening a barrow in a field known as "Monklands," belonging to Mr. R. Hill. It is situated about a mile N.W. of Thornton-le-dale, on the west side of the Lockton road.

The barrow had evidently been much reduced by the plough, but was some 3 to 4 feet high when we commenced operations. The diameter being somewhere about 60 feet. We were told by more than one ancient that in their younger days the barrow was covered with grass, and of considerable height; also, we were told, that it had been opened by the late Thomas Kendall, of Pickering, some 50 years or more ago. With what result we were unable to ascertain, as there is no catalogue extant of his work. Neither can we trace the barrow as being opened by Bates in his "Ten Years' Diggings"; nor by Greenwell & Rolleston in their "British Barrows." In the former work mention is made of four Tumuli being opened at Kingthorpe, vide pages 232 and 235, but there are no data to prove that the Monkland's barrow was one of them.

To the south-east there are the scanty remains of a smaller barrow, which has a more sandy nature and no clay.

About 50 paces to the north is an earthwork, which makes an almost rectangular bend to the south at a point N.E. of the barrow and passes between the two barrows, and can be traced as a double ditch in certain states of the soil. It passes southward till it cuts the Lockton and Thornton-le-dale road. The portion to the north has not been ploughed down. Towards the west it turns in an obtuse angle towards the south-west. What this

earthwork has been it is hard to surmise, but it is not contemporary with the barrow, nor does it appear to have had any relation to the entrenchment that can be traced along the edge of the escarpment of the Ellerburn Woods, which goes northward for many miles. The Rev. Arthur Hill, of Thornton-le-dale, is of opinion that the earthwork passing between the barrows marks more or less the line of the old enclosure previous to that made at the end of the eighteenth century.



Owing to our party showing more zeal than method the work was not altogether systematically carried out, still we cut a trench from E. to W. south of the centre, and whilst doing so at a depth of 18 inches portions of a vessel were exposed. This was within two hours of commencing operations. The upper part of the vessel was missing and had evidently been struck and carried away by a plough. The vessel was carefully excavated and was found to be resting on the right side of the pelvis of a human skeleton. During the excavation of this skeleton, the missing part of the vessel was discovered as well as two saws, *Plate II. B*, one rather coarse, with coarser serrations on one edge than the other; the other a beautiful specimen of a fine saw, serrated on one edge only. Near the skeleton a spear or javelin head (*see Plate II. A, 5*) was found.

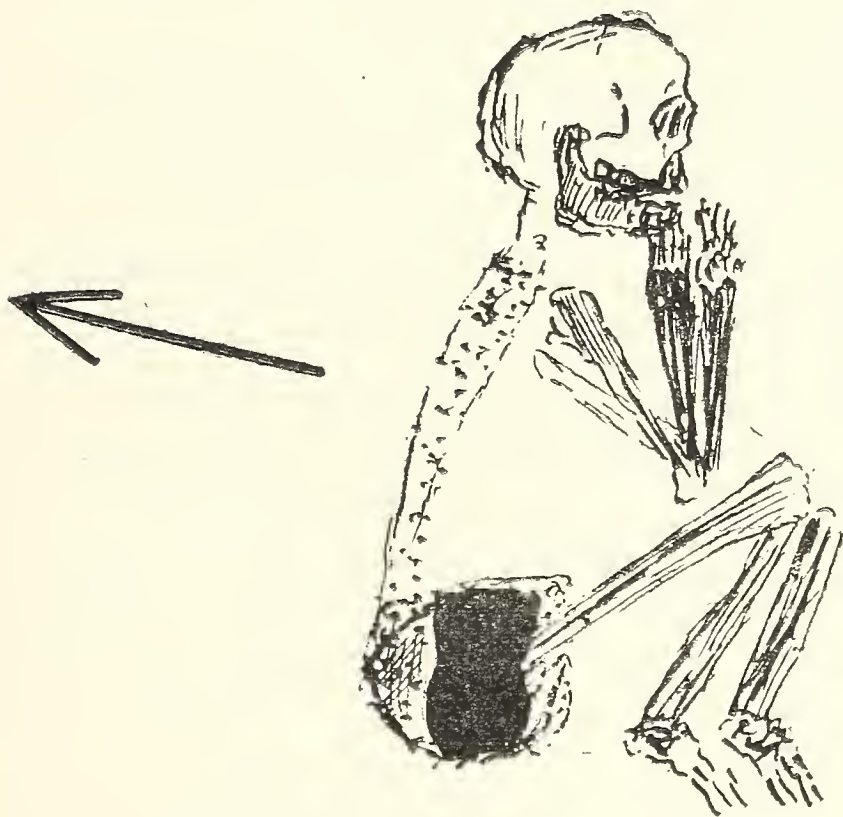
Evans, in his "Ancient Stone Implements of Great Britain," states that in the soil of a single barrow at Rudstone there were no less than 78 saws, a remarkable occurrence, as they are rarely found.

In Ireland, flakes converted into saws are scarce, so is the particular kind of urn found with this burial.

The skeleton was discovered on the west side of the barrow, and was lying on the left side with the head towards the east. The knees were drawn up to the chin and the legs flexed. The arms

were also flexed, the hands being together beneath the lower jaw. The long bones and parts of the skull were intact, but the smaller cancellous bones were only made out with difficulty. The length of time since the body was inhumed and the nearness to the surface had led to their disintegration. The skull was brachycephalic; the teeth perfect but worn, the angle of the jaw being square and massive. The thigh bone measured 18 inches, and from the top of the skull to the bottom of the pelvis the measurement was 36 inches, as accurately as we could tell. Taking the thigh bone as an index, .272 to .277, we calculate the person to have been about 5 feet 3 inches in height. The sex was not determined with any certainty, but it was probably that of a male.

No traces of any metal were discovered.



The vessel found is what is known as a Drinking Cup or Beaker. It is 7 inches high, and is $5\frac{1}{2}$ inches across the mouth. From the mouth to the junction of the upper and middle third it narrows and then swells out and again becomes smaller till it reaches its minimum circumference at its base. It is highly decorated and evidently has been worked with tools shaped like a blunt stunted fork. There have probably been several such instruments used, as the indentations vary from three or four to two dozen or more. It contained a few calcined bones. There is a discoloured patch on one side where the vessel has been in contact with the flesh.

The decoration consists of rings encircling the vessels at varying levels. Between the top and second ring is a series of straight vertical lines, made up of three or four indentations. Between the next set are two series of three vertical lines containing two dozen indentations, the spaces between being filled with similar V shaped lines, with the apex to the right. Next comes a series similar to the first rings. Then a blank space. Afterwards a repetition of the first and third series. Below these there is a series of double zigzags, the spaces being filled with vertical lines. Below this again a blank space and an inversion of the above zigzag and lines. Next we have two more circling rings and then a repetition of the above zigzag figure. Finally a set of three circling rings and then a blank space. The thickness of the vessel is about 1 cm. The material of which it is made is fine clay, and has not been turned on a wheel. It is somewhat distorted in shape, which is probably due to unequal pressure in the ground.

Although no two beakers have the same design, yet there are many that have been marked with similar tools, *e.g.*, *Fig. 82* and *83*, pages 95 and 96, "British Barrows."

It is curious to note that the decorations are similar to those used on our modern kitchen utensils. *Plate III. B, 4.*

According to the late Mr. Mortimer, drinking vessels are rarely found in the N. and E. Ridings of Yorkshire. In his collection at Driffild there are 162 vases and 38 drinking cups. In Mr. Mitchelson's Museum at Pickering, there are only 2 of the latter among some 135 vessels. In the Bateman collection at Sheffield, there are 2 or 3 drinking vessels that have been found in the Pickering district.

Drinking Cups or Beakers are almost invariably found in inhumed burials, and consequently have been thought to contain food, etc., for the spirit. We have the same idea in the ancient Egyptian burials, where considerable provision is made for the spirit or soul of the mummy.

The Hon. John Abercromby maintains that the beaker is the oldest Bronze Age Ceramic in Great Britain, that its importers were those brachycephalic people whose remains have been so largely found in round barrows and other Bronze Age burials. The association of beaker and brachycephalic skull in a short cyst is not an absolute rule, but so far as practical research has hitherto determined the point, the exceptions noted are very few.

From Mr. Abercromby's map of distribution of these beakers we see that they largely occupy the south, centre, and east of England, In Yorkshire they form a conspicuous group, from which they extend northwards, thickly studded along the eastern portion of Scotland as far as the Moray Firth. In Ireland one locality has yielded a specimen, viz., Moytirra, Co. Sligo, but all other forms of urns have been found.

According to the system of grouping adopted by the above writer, our vessel would be placed in *Type A*, i.e., High brimmed globosa cup. It would come in *Sub-type A1*, and would be much similar in shape to the one in the possession of the late Mr. Mortimer, found at Garton Slack, East Riding of Yorkshire. This places it in the earliest type of beaker.

In the account of the Glastonbury Lake dwellings it is conclusively proved that considerable skill in native art existed in Pre-Roman days. We have then to set back our burial and its accompanying beaker beyond the Iron Age into the Early Bronze Age. This must give a considerable age to our "find," possibly from 2,500 to 3,000 years.

The centre of the tumulus had been disturbed and fragments of more than one urn were discovered along with portions of human bones. One of these urns had evidently been of large size. *Plate III. B, 3*. In this disturbed portion we came across two large slabs of stone laid horizontally. These may at one time have protected the primary interment. Several pieces of worked flint were found. On the east side, at the extreme edge of the mound, was found an anvil or hammer stone. *Plate III. A*.

The hammer stone found at the opposite side of the tumulus to the beaker is $2\frac{1}{4}$ inches in its largest diameter. In *Plate III. A* is seen a deep depression on the top, there is a slightly shallower one at the bottom. On the near side is a smooth surface, which extends for half of the circumference; there are two shallower depressions on the remaining portion. If taken up in the right hand, the thumb fits into the upper hollow and the second finger into the bottom one; the first finger resting on one of the side depressions and the third the other. When so held it forms a useful pounding hammer.

Some authorities describe this stone as an anvil on which the flints were probably chipped.

Plate III. B, 1, 2, 3, shews fragments of urns found in the disturbed centre of the barrow.

The late Professor Huxley years ago pointed out that the round barrows were of Belgic origin, it therefore follows that they are responsible for the beaker type of sepulchral ceramic. In Ireland, beakers and brachycephalic skulls are rare in pre-historic burials. Later, as the cremation influence spread from the south, the beaker type of vessel would be gradually superceded and the Iron Age introduced.

The fact that these beakers show considerable artistic taste, and that although somewhat alike in shape they differ widely in the design of ornamentation, makes one wonder when and where they were made. Was there a factory, and were they ready-made as it were for the interment? Possibly there were skilled artisans who travelled about among the various tribes. It is difficult to think that each locality was capable of manufacturing such objects of art, and so universally similar in shape and idea. On the other hand, there would be considerable difficulty in transporting such delicate vessels. Possibly the people who made these vessels were nomadic.

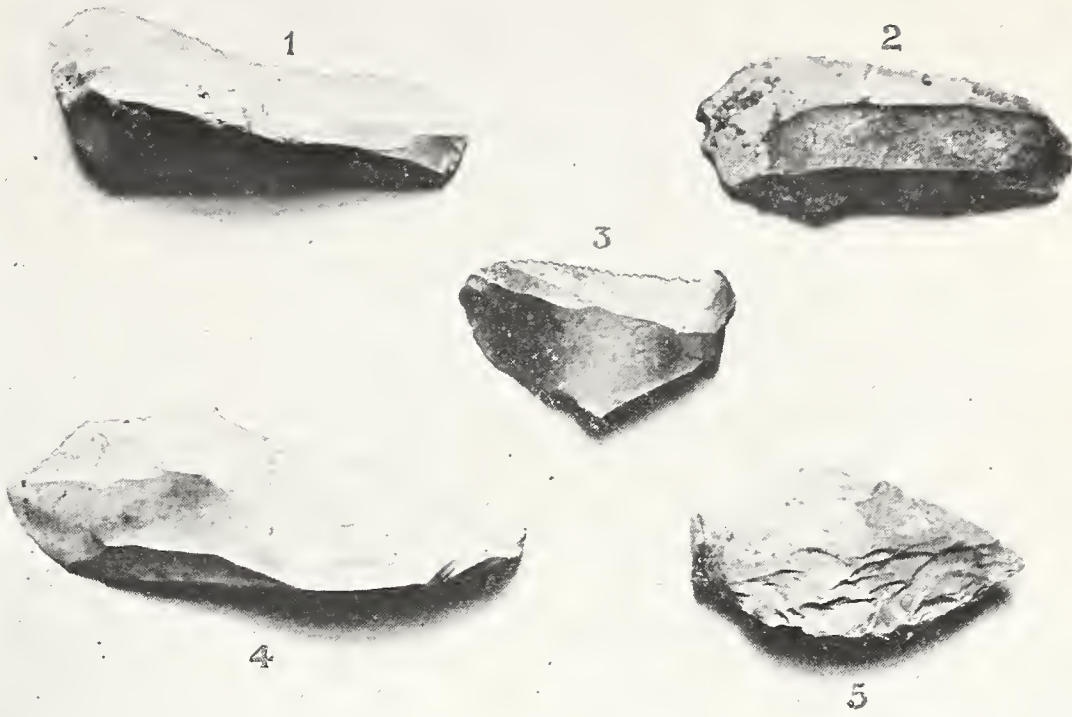
After our excavations at "Monklands," we proceeded to explore a small barrow on Pexton Moor. A short time before, Mr. Hill's gamekeeper when ferretting had noticed some metal thereabouts. We found a small barrow, some 20 feet across and about 4 or 5 feet high, composed mostly of sand. We were able to trace in the sand a mass of corroded iron, which formed a circle 30 inches in diameter. There were distinct marks of wood fibre on the inner side of this, proving undoubtedly that this was the tyre of a chariot wheel. Most of the metal had formed a conglomerate mass of sand and oxide of iron. The tyre was in a more or less upright position.

The excavation was not continued, but we hope to make further efforts at an early date.

The late Mr. Mortimer mentions that two chariots have been discovered in the North Riding, where they are evidently rare. The ground would not be suitable for their free movement.

We should like to take this opportunity to express our gratitude and thanks to Mr. R. Hill for allowing us to make these investigations on his property, and to Mr. S. Allanson, the tenant of "Monklands," who also gave us much valuable assistance in our search.





A



B

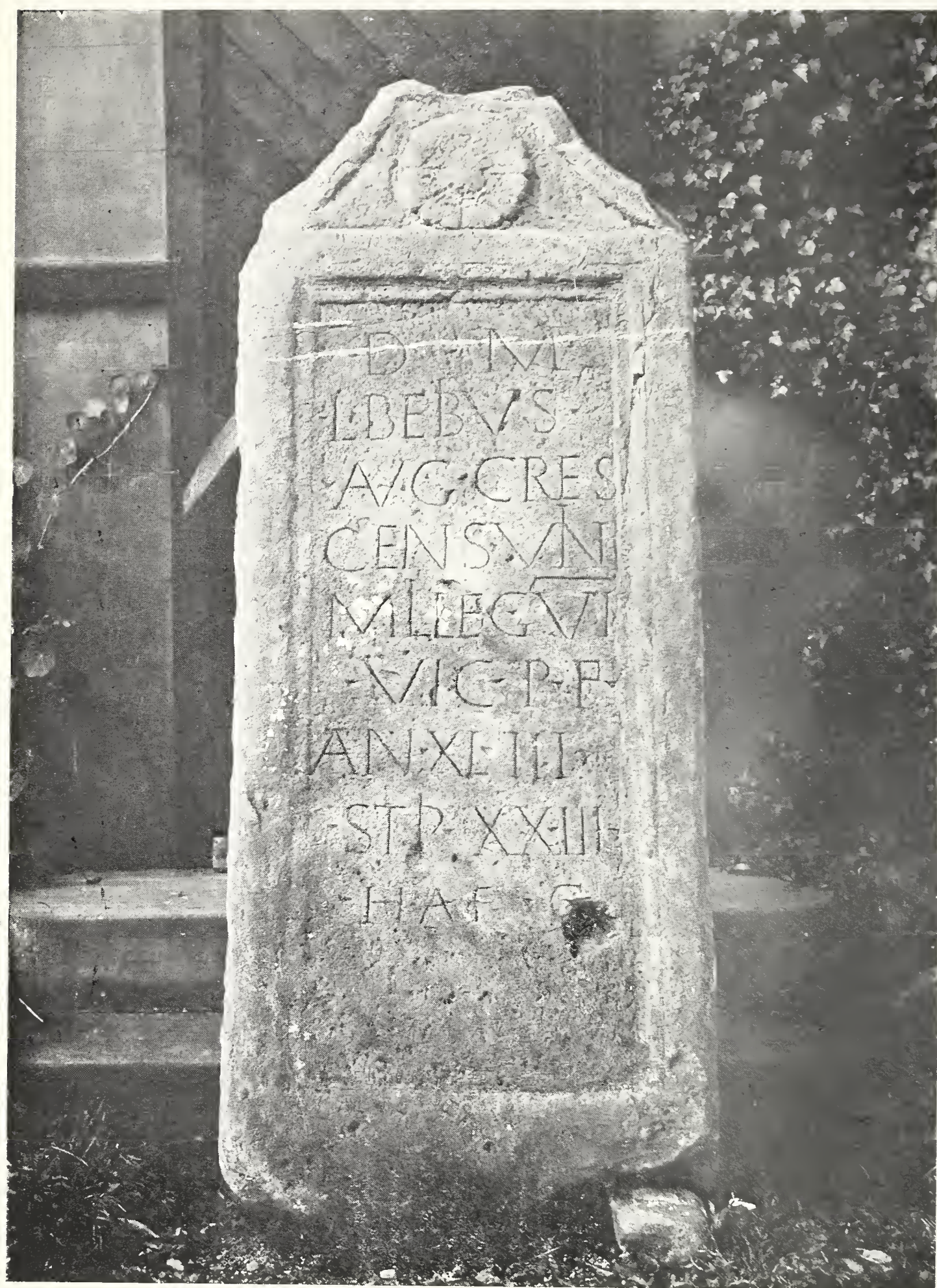


A



B





NOTE ON AN INSCRIBED ROMAN SLAB,

BY H. M. PLATNAUER, B.Sc.

In the course of some alterations made during the present year at the Mount School for Girls an inscribed stone slab was dug up in the basement of the building, about 20 yards from the road (Dalton Terrace), and about 2ft. 6in. below the road level. The stone is 6 ft. 1 in. long, 2 ft. 6 in. wide, and 7 in. thick. From the illustration the reader will get a better impression of the shape and general appearance of the stone than from any verbal description.

The circular ornament at the upper end of the slab is so worn and indistinct that nothing can be said of it with certainty. It may possibly be a legionary symbol. The inscription should probably be read as follows (letters in italics have been supplied)—*Dis Manibus Lucius* BEBIUS AUGusta CRESCENS VINdelicum MILES LEGionis VI VICtrici*s* Pia*e* Fidelis ANnorum XLIII STIPendiorum XXIII He*re*s A Faciendum Curavit.=(To the Gods, the Manes. Lucius Baebius Crescens of Augusta Vindelicum, soldier of the Sixth Legion,—the victorious, pious, and faithful—forty-three years' old, twenty-three years' service. His heir had this set up).

In this inscription, the most doubtful part is the last line. The "A" seems to be meaningless or superfluous. Professor Haverfield considers it to be a mason's blunder.* The name Baebius is not uncommon, and occurs frequently in Spain; the spelling *Bebius* is found in two monuments in Cadiz (v. Corp. Insc. Lat. II. 1743, 1777). "Baebius Crescens" occurs on a tomb near Talavera, but without praenomen (Corp. Insc. Lat. II, 944). "Augusta Vindelicum" (the modern *Augsburg*) was the chief city of Vindelicia, a province lying immediately south of the Danube, and corresponding to the N.E. of Switzerland, the N. part of Tyrol, the S.E. of Baden, and the S. of Bavaria and Wurtemberg.†

The lettering of the inscription is clear and bold, and seems to belong to a good period. Professor Haverfield is inclined to place it in the third, or late second century. On the whole, the monument is a better one than we should have expected over the remains of a private soldier, and we may fairly conjecture that the deceased was a person of good family, or at least of some wealth.

*It might be suggested that the mason intended a ligature "Æ," and the letters may be meant for an abbreviation of *haeres*.

†Although the reading given above is the most probable and has the weighty authority of Professor Haverfield behind it, we ought to point out the AUG. may possibly stand for AUGustini (or AUGustani) *filius*. The name "Augustinus" occurs on another York funeral inscription connected with the Sixth Legion. (Handbook, p. 51).

VOLCANIC CRATERS AND EXPLOSIONS.*

By TEMPEST ANDERSON, D.Sc.

(From 'The Geographical Journal' for February, 1912.)

THE subject of Volcanoes naturally divides itself into two branches—the Physiographical, or naked-eye one, and the Petrological, which latter deals with the chemical and microscopical structure of the rocks produced. This branch has by itself provided the subject of life-studies by such men as Sorby, Bonney, Teall, in this country, to say nothing of foreign investigators almost equally distinguished; but it is extremely difficult and complicated, and I do not propose to discuss it to-night.

The other branch deals with the physiographical phenomena of volcanic cones, craters, and lava streams; with deposits of pumice, tuff, ash beds; with dykes, sills and intrusive sheets, their structure and mode of production, and their alteration by weathering and other forms of denudation. It may fairly be included in physical geography, and is, therefore, suitable for consideration by this Society. Even this is far too large a subject to be dealt with in a single lecture, so to-night I shall confine myself chiefly to one division of it, viz. Craters and Explosions, and only mention the other branches incidentally and by way of illustration.

If we watch most volcanic eruptions, small enough to be safely approached, such for instance as that of Vesuvius in September, 1898,† we see a discharge from the crater of vast quantities of dust and ashes suspended in steam and various volcanic gases,† while lower down the cone is a discharge of lava, building up in this case a hill, Colle Umberto primo.

These mark two very distinct factors, and according as one or other predominates, the eruption may be classed as of the explosive or effusive type. Thus the eruption of the Soufrière in St. Vincent in 1902 was wholly explosive, no lava being discharged, while in those of the Hawaiian and

* Royal Geographical Society, November 20, 1911.

† Slide shown.

of the still liquid, or, at any rate, pasty lava underneath, and rolls down the ends or sides of the stream with a very characteristic noise. Large fields of lava are thus commonly formed, covered with great rough, sharp-edged blocks, and they present an almost impassable barrier to locomotion. If the lava underneath the layer of scoriæ retains sufficient heat to remain liquid long enough it parts with most of its imprisoned vapour, and may eventually emerge from under the covering and begin to assume the form to be next mentioned. Quite often, however, it originally contained little vapour, or has already lost the greater part when it comes out, and in this case it flows at once with a smooth surface. In either case this molten surface rapidly loses heat, and becomes treacly and viscid. The flow still continuing, this viscid layer is carried forwards and pushed up into a ridge like a cord, and solidifies in that form; while the same happens to the surface of the portion which follows, so that another cord is formed behind the first, and the process is repeated till the stream or sheet of lava is entirely covered with corded structure. I watched this process on the Colle Umberto primo, the new hillock that formed on Vesuvius near the observatory in 1898. The lava streams which were often numerous, were constantly cooling and giving place to new ones. They were not conspicuous by daylight, though they could be readily traced by the pale blueish vapour which they gave off.† At night, however, the red-hot lava became conspicuous in the darkness. A party of us watched the wonderful phenomena on every evening from the top of the observatory, and I was even able to secure photographs † of the streams by the light they themselves furnished. These lava structures must be contrasted with the products of explosive eruptions, such as ashes, scoriæ and pumice.

The great eruption of the Soufrière in St. Vincent was entirely explosive, and the ejecta were in places 200 feet thick. They consisted chiefly of ashes with a certain number of ejected blocks, and the secondary phenomena produced by the contact of rain water with the hot ash were very remarkable.*

The eruption of Santa Maria † in Guatemala, in 1902, was also entirely explosive. The mountain was previous to the eruption a very regular cone, about 12,600 feet high, with only quite a small crater in the summit. By a series of tremendous explosions lasting two nights and a day, an entirely new crater was blown out of one side of the mountain. As nearly as I could measure it, it was seven-eighths of a mile in its longer diameter, and five-eighths of a mile in its shorter, while the precipice exposed in the side of the mountain was at least 5000 feet, say upwards of a mile, high. It is worth remembering that the corresponding precipice left after the eruption of Krakatau in 1883, which has hitherto been considered one of the largest on record, is only about 1200 feet high. In both cases

* T. Anderson and J. S. Flett, *Phil. Trans.*, part i. 1902, parts ii. and iii. 1907; T. Anderson, *Geographical Journal*, 1902.

† Slide shown,

also the dust was carried into the higher regions of the atmosphere, and gave rise to remarkable sunset effects.* The surrounding country for many miles was devastated and a large number of lives were lost, but the place is so remote that the eruption did not attract the attention it deserved.†

The ashes in these two last eruptions, and also in that of Tarawera in New Zealand in 1886, are consolidating by time and pressure into tuff, a soft porous rock, which by the action of rain and streams shows a characteristic feather-like pattern on the surface, and weathers into remarkable ravines.‡

The Tarawera eruption was a fissure eruption, a class which has of late attracted much attention. A series of small craters opened along the line of a great fissure several miles long, the chief action, however, being localized in Lake Tarawera, all the water in which was blown out, and the pink and white terraces which formerly existed there were totally destroyed. Percy Smith, formerly Surveyor-General of New Zealand, who was one of the first party to visit the scene of the eruption, told me that he descended 500 feet into the crater which opened in the floor of the lake, and which is now again filled with water.§ Fissure eruptions are also common in Iceland, and are generally accompanied by the discharge of enormous volumes of very liquid basalt lava. The historic eruption of the Skapta Jokul † in the latter half of the eighteenth century was of this class.||

When the early part of an eruption has been explosive, and a cone has been built up in the manner described, the magma which rises in the volcanic chimney (or vent) tends, towards the end of the eruption, to have parted with most of its contained vapour, and the mass often cools and solidifies in the form of a plug, which has been supported by the materials of the cone, acting as a sort of mould or matrix. If now the soft ashes are removed by any of the processes of subaereal denudation, for instance by the action of a river, the plug may remain standing and is called a volcanic neck.‡ Such are not uncommon, and good instances occur on the Rhine between Bonn and Coblenz, where they consist of columnar basalt, and at Le Puy en Velay in Central France, where the Rocher St. Michel † consists of a mass of agglomerate, *i.e.* angular fragments of volcanic material, which had been churned up and down in the chimney while hot and finally become coherent.

A variation of this process has produced the Domitic Puys in Auvergne, of which the Grand Sarcoui † is one of the best examples. The lava as it issued was so pasty and viscid that it did not run down as a stream, but formed a rounded flattened dome between two cones of fragmentary materials, one of them very perfect, both of which appear to have been formed in the early part of the same eruption.

* Verbeek, 'Krakatau,' also 'Report of Royal Soc. Com.'

† T. Anderson, *Geographical Journal*, 1907.

‡ Slide shown.

§ See his Official Report.

|| Helland, Lakis Kratere.

A further stage of the same process occurred in Mont Peleé, in Martinique, in the great eruption of 1902, in which the city of St. Pierre was destroyed. A dome was first formed in the bottom of the old crater, but did not nearly fill it. The material of which it was composed contained large volumes of dissolved gases, and broke down as described above in the case of the Soufrière of St. Vincent. The incandescent mixture passed out through a V-shaped notch in the side of the crater, rolled down the mountain-side as an avalanche, and destroyed St. Pierre.

As the eruption became less violent a plug formed in the volcanic chimney as above described, and being pressed forward from below, forced its way through the dome, and formed the famous spine.† It rose to a height of about 800 feet above the top of the mountain, and it is believed that material to the extent of above 1000 feet was actually pushed out; but it was crumbling away all the time, and when I ascended the mountain twice, about five years later, only a rounded stump was visible, with a ring of very active fumaroles marking its junction with the dome, and with the talus of fallen *débris*.

In the old world we are accustomed to regard volcanoes as mainly responsible for the discharge of material and the building up of cones and deposits of lava and tuff, but in the new world, and especially in the Pacific, the geologists are accustomed equally naturally to invoke the agency of subsidence as the cause of any otherwise inexplicable hollow. During a recent visit there I took the opportunity of examining as many as possible of such real or supposed subsidences, and I select for our present discussion some of the most characteristic.

In an ordinary explosion crater, towards the waning of the eruption, there is often deposited a large bulk of material containing clay and various sulphur compounds. The gases which rise from the vent during the solfatara stages often also contain sulphur compounds. These, by contact with the air, tend to become oxydized into sulphuric acid, which, combining with the alumina of the clay, forms alum. Water percolating through this dissolves and removes the alum, and subsidence of the surface takes place. Such undoubted subsidences vary in area from the size of an ordinary sitting-room to several acres. Many such subsidences are found in the volcanic district of New Zealand, as at Waiotapu,† Roto Kawa, and Wairakei,† and of the reality of the cause in their cases I feel no doubt, but it is more difficult to accept it when a lake several miles in diameter is under consideration, and where no remains of alum beds are visible.

The great volcano of Kilauea in Hawaii, or Owyhee as it used to be called, is a good example of the type of effusive volcanoes as they occur in the Pacific, and its crater is often quoted as an example of a subsidence. The lava discharged from it is so fluid that the slope of the outside of the cone is only 5° or 6°, and in places I believe as low as 2°, so that the crater appears to be more a hole in a plain than in the top of a mountain, while

† Slide shown.

there is singularly little evidence of explosive action, such as the presence of ash, lapilli, or ejected bombs, all of which are very infrequent even right up to the brink of the crater. The details of its structure were shown by the aid of a series of photographs taken during a month's stay at the volcano house. These showed among other things the lake of liquid lava, partly crusted over, and with the crust broken up by a series of cracks, through which the red-hot molten lava was visible at dusk, and which were photographed by their own light, as was Old Faithful, the great fountain of molten lava, which usually plays at intervals about once a minute or oftener. Bays were also formed in the crater during this visit by the remelting of parts of the black ledge † of lava. They were comparable in size to the quadrangle of Burlington House, and the lava which was remelted was entirely removed.

Matavanu is a new volcano in Savaii, an island in the Samoan group, which only came into existence in 1905. Its crater † contains a lake, or rather river, of molten lava, comparable to, but more active than, that of Kilauea. The incandescent lava is so hot as to appear white-hot, even in tropical sunlight, so fluid as to rise in fountains more active than those in Kilauea, and to break in waves on the walls of the crater. Finally, the lava rushes with the velocity of a cataract into a tunnel, or rather gulf, at one end of the crater, where it disappears and runs underground under the crust of a large lava-field † for a distance of 10 miles to the sea, into which it falls with tremendous explosions.† Its course under the lava-field is marked by a number of large pits or fumaroles,† which appear to have been formed by the remelting and falling in of the crust over the tunnel. They are very similar in structure † to the pit craters of Hawaii,† the origin of which has given rise to so much discussion, and which were possibly formed in a similar manner.

As the lava at the seaside escapes from under the surface crust, it, where the action is not sufficient to set up explosions, begins to form lobes like those of ordinary corded lava †—and this corded structure is, in fact, formed in the usual manner in places above the water-level. Where, however, it falls direct into the sea, the surface is chilled before there is time for it to be wrinkled up into the corded structure, and it becomes consolidated into the characteristic form of one variety of pillow-lava.† This mode of formation, though previously on other grounds suspected by geologists, was, it is believed, first actually watched by the author in 1909.

The PRESIDENT (before the paper): The reader of the paper to-night, Dr. Tempest Anderson, bears a name well-known to geographers. Many of you here present are familiar with the work he has accomplished in connection with some of the greatest volcanoes in the world, and with the magnificent photographs with which, when he lectures to us, he illustrates their activity, and the effect exercised by them upon the surface of the globe, which is, of course, the main study for which geography exists. Eight years ago Dr. Tempest Anderson

† Slide shown.

gave, at a meeting of this Society, at which I had not the good fortune to be present, an account of several terrible volcanic outbreaks which had occurred in the West Indies, and three years ago he gave an equally instructive paper on the volcanic phenomena of Guatemala. Probably no one in this country has seen more volcanoes or more eruptions, fortunately so far without injury to himself, than our lecturer this evening, and to-night he will take us to several typical volcanoes in various parts of the world, and by means of his own descriptions and a fine series of slides, will illustrate the different kinds of explosions and the various character of craters. I will now ask Dr. Tempest Anderson to deliver his lecture.

Dr. STRAHAN (after the paper): I think you will agree that it has been a great privilege to see this wonderful series of photographs of Dr. Tempest Anderson's, gathered from all parts of the world in which volcanoes are active. The British Isles have been said to contain a sample of everything connected with geology—to be in themselves a perfect little museum, but there is one thing which they do not possess, and that is an active volcano, though I do not mean to say that that is a matter for regret. But if we have no active volcanoes we have many dead ones. The British Isles are situated on the margin of the European-Continental area, in a position where land and sea meet, and in which volcanoes are frequently developed. We may, therefore, suppose that our freedom from active volcanoes at the present moment is temporary. Of course in past times there has been plenty of igneous action in the British Isles; for example, some of the Western Isles of Scotland are the remains of a prodigious mass of basalt which was poured out, as supposed, from a fissure, for no volcanic cone appears to have been reared, but a long crack opened in the crust of the earth, from which lava welled out in huge quantities. The islands I refer to are merely remnants of that huge mass which have been left by the sea. But what I have in my mind at the moment is a beautiful study of the results of a volcanic outburst which may be seen in the cliffs near Weston-super-Mare. There, in the Carboniferous limestone teeming with fossils, you may see proof that the bed of the sea was suddenly overspread by lava. The molten rock, cooling more or less quickly under the sea, developed that peculiar structure which has been alluded to by Dr. Tempest Anderson as pillow-structure. Here, therefore, is a case in which his studies of lava flowing into the sea have proved of much value to geologists, for they enabled us to see under what conditions it could happen that the lava should be divided up into huge pillow-like masses with limestone in between. While this eruption was going on all the organisms were driven away. But presently the lava ceased to flow, and then some of the organisms began to struggle back, but only a few of the more hardy species, for the rock which lies next above this lava consists chiefly of volcanic ash. There were for a time alternations of coarse and fine ash, but gradually the showers abated and the water cleared. The episode came to an end, the teeming fauna of the Carboniferous-limestone period overspread the spot, and perfect tranquillity reigned. All this is recorded in the cliff, and anybody can see it by hammering over the rocks. But after all the rocks are so to speak dead, and it is as well that we should know what the scene was like when the volcano was alive. Apart from witnessing an actual eruption, there is no better way of realizing the scene than having the great privilege of seeing a series of photographs presented by Dr. Tempest Anderson. The series has been got in the course of many years at considerable expense and trouble, and I expect (though he has not enlarged upon that subject) with no little personal risk.

Mr. BRUCE MITFORD: I have little to add to the interesting and instructive lecture which Dr. Tempest Anderson has given us, apart from a few observations

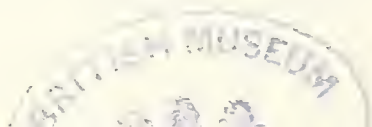
which have come under my notice in Japan. A good many people are inclined to look upon the subject of volcanoes with a kind of mild contempt. Not an hour ago I heard a gentleman describe the crater of Kilauea, which Dr. Tempest Anderson showed us just now, as a "cesspool," adding that he certainly never wanted to see another. Similarly, the famous Fujiyama, in Japan, has been irreverently described as an "ash-heap:" but it is difficult to understand how any one who has looked into the crater of an active volcano can fail to feel a profound respect, not only for the volcano itself, but for the subject as a whole. Several years ago, I believe, Dr. Tempest Anderson published a most interesting book entitled 'Volcanic Studies in Many Lands.' I read that book in Japan with much appreciation; but I could not help reflecting, as I realized what very extensive journeys Dr. Anderson had to make to collect those very valuable studies, that, had he been resident in Japan, he could have found as many volcanic subjects, and certainly a greater number of active volcanoes, within a day's journey of Tokio. I understand, however, that Dr. Anderson finds himself unable to resist any longer the "call of the East." Japan is said to possess a special fascination for the visitor, and when that visitor is a vulcanologist, I am afraid the consequences might be so serious that we must reconcile ourselves to not seeing Dr. Anderson again for a considerable time.

I think it may be said that the science of vulcanology has suffered by being unduly localized. It has centred itself, to a large extent, about two particular volcanoes—Stromboli and Vesuvius—presumably because these are the most accessible. The literature that has accumulated itself about Vesuvius is enormous. I dare say some one with a genius for statistics would succeed in showing that it approximates in bulk to the volcano itself. Obviously this must have involved a considerable amount of repetition, and the science of vulcanology would have been richer if some of this energy in research had been expended on volcanoes in other parts of the world. Dr. Anderson is doing a good work in this direction, for he has shown us splendid subjects from a great many different lands. With regard to types of volcanoes, Prof. Mercalli of the Vesuvian Observatory, as you have heard, divides them into two classes, according as they resemble the action of Stromboli and Vesuvius respectively. However, any one visiting Japan, for example, would find volcanoes which could scarcely be brought under either of these headings. He would find a volcano like Bandaisan, which in a few seconds blew away an adjoining peak of the size of Snowdon, destroying four villages with their inhabitants, and covering with *débris* an area of 27 square miles, but without leaving behind a single trace of scoriæ, volcanic ash, or lava. Then, again, there is the volcano which is performing, in a very literal sense, the function of "terrestrial respiration"—such a volcano, for example, as that of Oshima, off the Gulf of Tokio, which seems merely to "breathe," in a series of gasps. Each gasp is a cloud of steam: nothing else happens, and this goes on incessantly. Then, again, you will find a volcano which emits a continuous torrent of steam from huge fumaroles in the floor of its crater without any explosive action; and, finally, you have a volcano like Asama, which seems to combine all these functions in itself. This volcano, for the last three years running, has signalized the approach of winter in a startling way. In the first week in December each year, almost to the day, a violent explosion has taken place within its crater, which was heard and felt in Tokio, 100 miles away, and suggested to most people an earthquake of unusual character, or an explosion of gunpowder at some factory near by. Curiously enough, when the volcano was subsequently examined, few, if any, traces of the outburst

were to be seen, beyond a few large stones scattered about the upper surface of the cone. Such examples of volcanic action as these hardly come under the heading of those mentioned by Prof. Mercalli as either Strombolian or Vulcanian. As to the question of subsidence, it seems to me that the chemical theory does not suffice to account for the vast majority of cases. It is of interest to note that nearly all the lakes in Japan are in the volcanic districts. Some of them are crater-lakes, pure and simple; but others occupy large shallow depressions at or near the bases of volcanic cones, are practically circular, and sometimes as much as 10 miles in diameter. The formation of such lakes must be explained on the more simple ground that the strata in the vicinity have collapsed as the result of the removal of vast quantities of material from beneath the surface through volcanic agencies.

The PRESIDENT: I believe there is no one else who is prepared to address us, but I am quite sure you will not wish to separate without moving and carrying a vote of thanks to the reader of the paper. For my own part I should like to say that I never heard a paper read here which more impressed me with the conviction that the lecturer was a master of his subject. So markedly was this the case that he seemed, so far as I could judge, to be quite independent of his manuscript, and he talked as easily and well in terms of science as most of us talk badly in the vernacular. The same observations apply in a scarcely inferior degree to the speeches of the two gentlemen who were kind enough to address us afterwards, and who spoke with a very intimate knowledge of the subject, to which I cannot lay claim, although in olden days I have climbed to the top of a good many volcanoes in different parts of the world. When Mr. Bruce Mitford was talking to us about Japan and about the fearful explosion of Bandaisan, which occurred some years ago in that country, I remember an incident which was mentioned to me by Prof. Milne, who as you know, is a great authority on seismology and kindred branches of science. I was in Japan shortly after that great eruption took place, which, as Mr. Bruce Mitford told us, blew out the entire side of a vast mountain and discharged a volume of material that succeeded in absolutely obliterating from existence several villages and killing many thousands of people. He said he had been in that neighbourhood just after the explosion, and he had naturally inquired how, even in spite of the suddenness of the eruption, the mortality had been so terrific, and how it was that no warning had been given to anybody of the imminent catastrophe; and he had ascertained that when the explosion took place there was one man, a native Japanese, who was looking after his herds on the side of the mountain and witnessed the occurrence. There was no reason apparently why he should not have warned the people living in the villages a little lower down. By an extraordinary accident he managed to escape himself, and when asked afterwards whether he had seen the explosion he said that he had, but in answer to the further question why he had not gone down to warn the people in the villages below he replied that he could not do that because he had seen a black fox and therefore knew that the eruption was an optical illusion. Apparently a Japanese peasant seeing a black fox is so firmly convinced he is bewitched, that he does not believe in any unusual phenomena that may occur at the same time. This suggests to us that when Dr. Tempest Anderson makes a journey to Japan, as we are told he is going to do, he will probably come across some specimens of the human race more simple than those with whom he is accustomed to deal. But however that may be, I can only hope that he will bring back from that country information and data that will take the shape of another lecture here at no distant date.

PRESENTED





EXPLOSION CRATER OF SANTA MARIA, GUATEMALA. SHOWS DENUDATION OF ASH DEPOSIT.

(*T. Anderson.*)

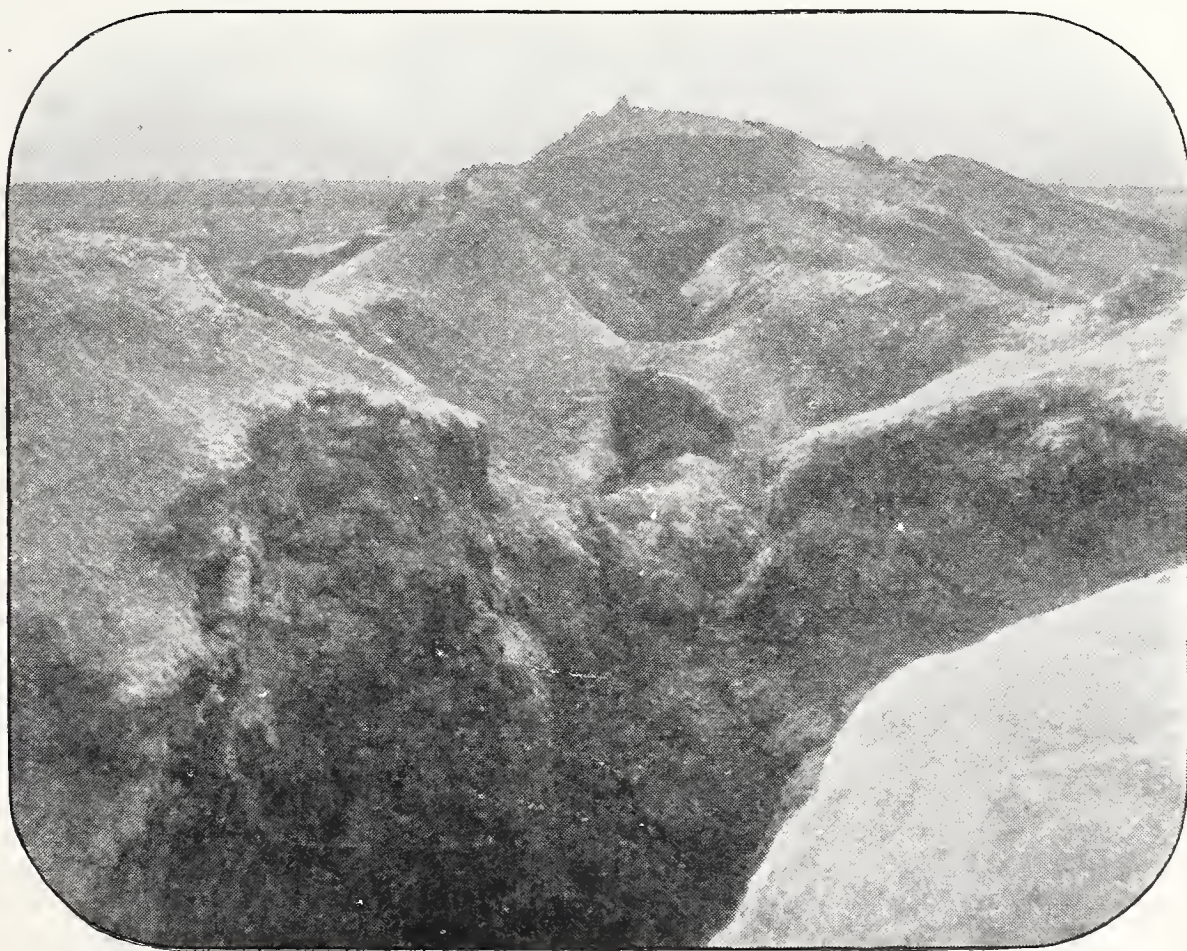


DETAIL OF A LAVA-STREAM IN THE FOSSA VETRANA, VESUVIUS. CORDED LAVA IN FOREGROUND.



STROMBOLIAN EXPLOSION, STROMBOLI.

(T. Anderson, photo.)



LAKIS KRATERE, SKAPTA LAVA, ICELAND. A FISSURE ERUPTION.

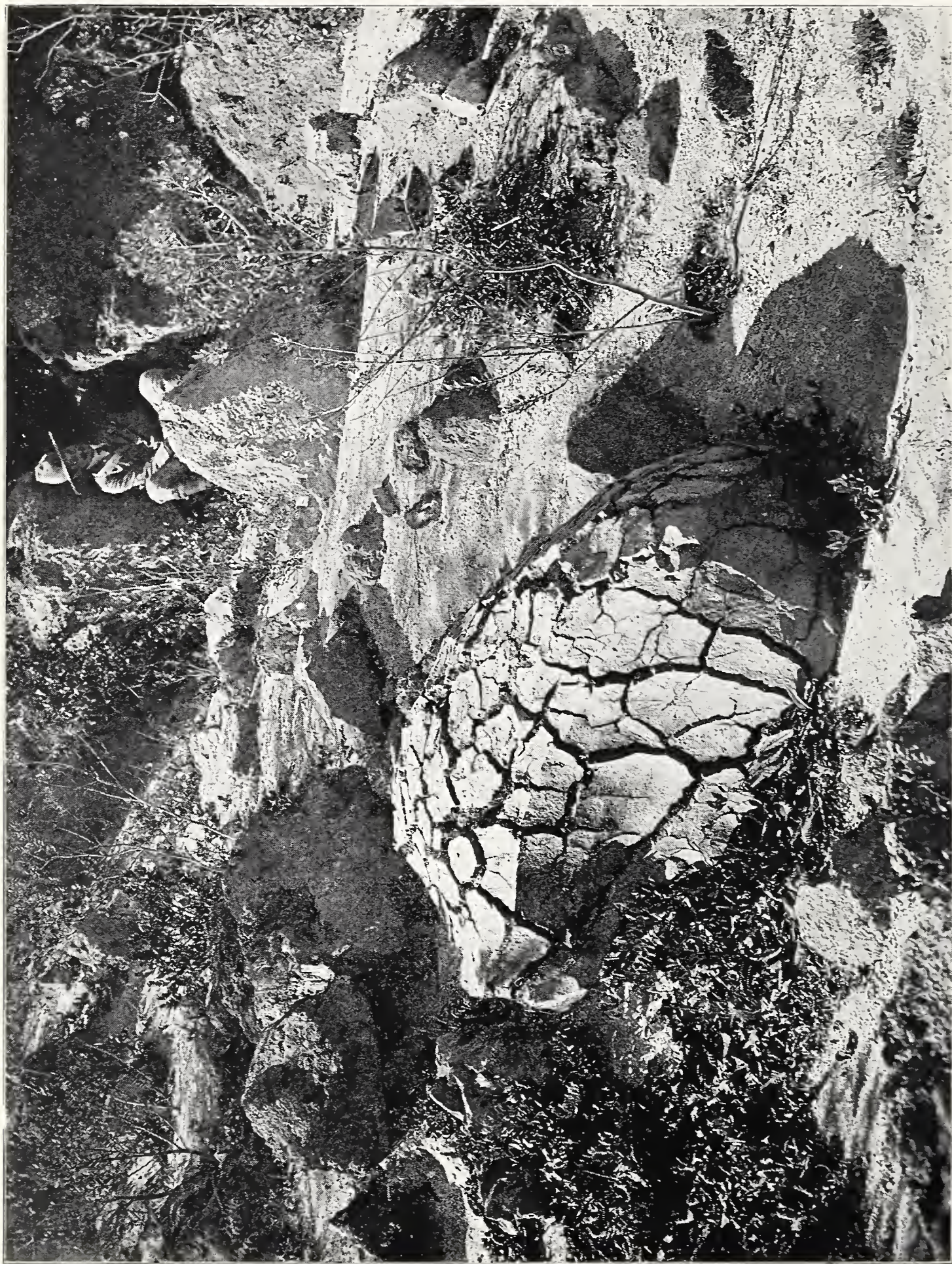
(From Tempest Anderson's 'Volcanic Studies.' Murray.)





SCORIACEOUS LAVA OF 1886, NEAR NICOLOSI, AETNA.

(From *Tempest Anderson's 'Volcanic Studies.'* Murray.)



BREAD-CRUST BOMB IN THE CRATER OF CERRO QUEMADO, GUATEMALA.

(T. Anderson, photo.)



ROCHER ST. MICHEL, LE PUY, CENTRAL FRANCE. VOLCANIC NECK.

(From *Tempest Anderson's 'Volcanic Studies.'* Murray.)

